



INFORMATION TECHNOLOGY CONSOLIDATION FEASIBILITY STUDY

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<http://da.ks.gov/kito/cita>

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I. EXECUTIVE SUMMARY

Senate Bill 572 authorized the Chief Information Technology Architect (CITA) of the State of Kansas to “evaluate the feasibility of information technology consolidation opportunities.” The focus of the IT consolidation evaluation is to include “facilities, staff, applications, networks, disaster recovery operations, data centers, access methods, and any other aspect of the state’s information technology architecture.”

From June 1, 2010 to October 1, 2010 the CITA facilitated meetings with state agency IT leaders, administered a survey of state agencies on the IT consolidation topic, researched other state governments’ IT consolidation initiatives, and had discussions with IT experts Forrester and Gartner on the topics of IT consolidation. The data obtained was analyzed and used to formulate the following consolidation strategies and recommendations¹:

DATA CENTERS: The State of Kansas should invest in two new data centers: a primary data center located in the Topeka area and a secondary data center located on, or near, one of the regent institutions. Once the data centers are built, all state agencies should begin a transition into these new data centers and abandon their old data center space.

PHYSICAL SERVER LOCATION: All state agency computer equipment should be immediately moved into the new state primary and/or secondary data center(s) when the new data center facilities are operational.

SERVER VIRTUALIZATION: State agencies should continue to virtualize all appropriate servers. The Division of Information Systems and Communication (DISC) should aggressively move forward on the Server Virtualization service they have proposed. State agencies should begin utilizing the DISC virtualization service for all appropriate servers when current servers come to end of their life and/or a new server purchase is required. If new data center space is not invested in, small and medium sized agencies along with large agencies that have not begun server virtualization should be given first priority for utilizing this service.

STORAGE: The State should invest in at least two modernized Storage Area Networks (SAN) to host critical state data. The SAN architecture should be designed for redundancy to avoid outages similar to the ones that occurred in Kansas and Virginia in 2010. DISC will provide a storage service to all state agencies with multiple data tier levels offered to give agencies flexibility on their data storage requirements. All non-centralized storage investments should be frozen and all new storage projects and investments should use the centralized storage service.

ELECTRONIC MAIL: The State should consolidate into one email solution for all executive branch agencies. Legislative and Judicial branches of government should consider using the centralized email solution once the executive branch is fully migrated to the new solution. This project should occur regardless of any other IT consolidation strategy.

UNIFIED COMMUNICATION AND COLLABORATION: DISC should continue moving forward on their Unified Communication and Collaboration (UCC) project.

¹ This study recommends that the universities in Kansas, under the direction of the Board of Regents, work to consolidate IT in each of their respective Universities. Unless directly mentioned, the recommendations laid out in this Study do not apply to the Regent Universities.

IDENTITY MANAGEMENT: The State of Kansas should consolidate into one centralized Active Directory (AD) system for all executive branch state agencies. This solution should be architected to allow for agencies the ability to add, modify, and change their own employees. Legislative and Judicial branches of government should consider using the centralized AD solution once the executive branch is fully migrated to the new solution. This project should occur regardless of any other IT consolidation strategy.

OTHER MIDDLEWARE APPLICATIONS: The State of Kansas should develop a consolidation strategy and roadmap for all middleware applications used by state agencies. These applications include but are not limited to: Document Management, Workflow, Enterprise Service Buses, Business Intelligence, Call Center, Customer Relationship Management, Data Warehouse, and Master Data Management.

DESKTOP SUPPORT: The State of Kansas should move toward consolidation of the resources and support staff provide computing services to the state workforce. All devices and all products should be purchased centrally and deployed to all employees. A consistent upgrade and replacement model financed through FTE based cost recovery will provide a more stable and compatible technical environment for all workers. This approach will also bring more efficiencies to the purchasing process, reduced complexities to the technology components, and more effective support for all workers by using best practices and lessons learned once for the entire state. An advisory council should be established to guide the evolution of these resources, financial shift, and service levels to be delivered under consolidation.

NETWORK SUPPORT: The State of Kansas should continue with the successful strategy of network modernization of core network to merge data and voice networks. In addition, the state should consider consolidating all KANWIN and agency voice and data network technicians under DISC. In this model, DISC would be responsible for the full network and component delivery in all non-regent institution state facilities. The State should create a new Network Governance structure with two levels. The top level, an Information Technology Executive Council (ITEC) subcommittee would coordinate all state network efforts. This subcommittee would consist of representatives from state and local government and the private sector. The next level, a KANWIN oversight committee, will oversee the KANWIN roadmap, performance, and prioritization. The state should also consider two network re-architecture efforts: an effort to allow more data and application sharing within state government and an effort to allow counties to become more efficient and to reduce cost.

AGENCY DEVELOPMENT STAFF: State agencies should always maintain their own unique development staff. Regardless of consolidation strategies, it is best practice to leave developer, data owners, data administrators, and business analysts as employees of each agency. These positions require intimate knowledge of agency business processes. However, the development model will change under IT consolidation in order to take advantage of consolidated services like enterprise service bus, document management, and workflow solutions. This changing development model will require very specific skill sets. It would be unfeasible for every agency to hire this type of specialized employee. DISC, working with all branches of government, should research the demand for a centralized pool of application developers hosted by DISC that could be available to state agencies and in all branches of government. Also, current application development staff should be adequately trained on advanced architecture and design skills in order to leverage the new technologies available to them in a consolidated IT environment.

While obtaining the data for this study there were a number of non-technology concerns articulated by industry experts, technology leaders from other state governments, and our own state IT leaders. These concerns and risks must be solved or mitigated before IT consolidation in Kansas could be successful:

LEADERSHIP AND GOVERNANCE: IT consolidation projects fail without proper executive leadership. The Governor of Kansas should sign an executive order mandating IT consolidation for executive branch agencies in Kansas. The Governor's leadership role is foundational for IT consolidation success. In addition, the role of the Executive branch Chief Information Technology Officer (CITO) should be expanded. All current responsibilities of the CITO would remain, but the role would expand to include approval authority on all Information Technology purchases by state executive branch agencies, and to provide direction and coordination of the statewide shared services outlined in this Study. Other states have shown that a properly empowered CITO shifts the discussion of IT towards business driven initiatives and project coordination. States with the most IT consolidation success have the executive branch CITO as a cabinet position. This shift allows Kansas to focus on project prioritization, financial shifts and to better serve our citizens and businesses. A cabinet level CITO is recommended but not required for success if the CITO is given appropriate authority and has the support of the Governor.

DISC'S ABILITY TO EXECUTE: Under these IT consolidation strategies, DISC would retain and expand its role as the central IT agency for Kansas. IT consolidation's success will be predicated on DISC's success. Historically, DISC is a leader in providing state IT services, and has a successful track record with previous IT consolidation projects. Under the recommendations outlined in this study, DISC would expand its role in providing IT services for the state. Agencies are concerned the quality of received services will diminish when they are provided through a consolidated model and that direct loss of control of resources will make services less responsive to agency business needs. To address these concerns, DISC must work hard to maintain and build the confidence of other state agencies. DISC must foster a culture of collaboration and facilitation with state agencies. DISC should renew its focus on outstanding customer service, communication, and complete transparency. Finally, DISC must have the resources needed to deliver high quality and reliable services under a consolidated model. Expecting DISC to operate a much larger equipment base in the existing physical facilities with their constrained environmental attributes will place the entire state at significant risk. In addition, expecting DISC to take responsibility for the increased tasks inherent in a consolidated model without a significant staffing increase will only result in the worst agency fears being realized.

SECURITY: State IT leaders are concerned that the unique requirements each agency has to secure their data and computer equipment will be marginalized in a consolidated IT environment. While security requirements are complex and vary by agency, other state's IT consolidation projects have found these complexities can be managed with a combination of organizational, policy, and governance changes.

ORGANIZATIONAL CHANGES: The State of Kansas needs several preparatory activities in order to manage the proposed consolidation efforts outlined in this study. These activities deal with enhancing the tools, processes, and skills DISC and agencies will leverage to provision, manage, and administrate consolidated IT services. DISC should be the central coordinator for the deployment of these tools, processes, and skills. Also, it should develop consistent training programs to support the evolution in each consolidation effort. DISC and state agencies must participate and engage in conversations for each consolidation effort and identify

the combination of best practices that should be used by the State of Kansas. DISC's organization will change dramatically in size and scope of activities. It is believed that in order to absorb this dramatic change in size and complexity that significant reorganization will need to occur to make DISC more effective and efficient. The reorganization will be a multiyear multi-step process, but will be critical for IT consolidation success.

BUY-IN: IT consolidation is not a universally popular notion across state agencies. The status quo gives them the flexibility to solve their own problems in the way that makes sense for their individual agencies, but allows for redundant, siloed, and incompatible solutions. In a consolidated IT environment many of our IT employee's roles will change. The possibility of change leads to uncertainty. Other states have told us this uncertainty can slow down, and even destroy, consolidation activities. The human factors associated with IT consolidation must be accounted for and mitigated if there is any hope for successful consolidation. These strategies revolve around an empowered executive branch CITO, an effective and responsive central IT organization, a focus on customer service and communication, and preparing state IT employees for their new roles and giving them adequate training.

If the IT consolidation strategies and recommendations are implemented successfully, the benefits for Kansas will include:

IMPROVED GOVERNMENT EFFICIENCY AND EMPLOYEE PRODUCTIVITY: The State of Kansas has an exceptional employee base. Efforts to consolidate and streamline IT will enable them to be more productive. Instead of having redundant agency IT teams all performing the same duties, there could be one single team maintaining consolidated solutions. All state employees need basic capabilities in order to achieve maximum efficiency. Successful IT consolidation projects involving email, identity, data sharing, and unified communications and collaboration have the ability to revolutionize the way state employees perform their jobs. In a consolidated environment employees will have modernized tools and capabilities allowing them to perform their jobs better, more accurately, and more effectively.

IMPROVED GOVERNMENT INTERACTION WITH BUSINESS AND CITIZENS: Kansas is underutilizing its ability to support businesses and individuals in Kansas. Agencies develop their own unique ways to communicate, regulate, license, and support their customers. IT consolidation projects can help with this transition. Currently there is no easy way to share data across agencies. With a common identity solution and a modern enterprise data bus, it will be easier to share data and communicate between state agencies. Having these foundational components in place will allow for the next generation of business applications to be developed that utilize this enhanced functionality.

IMPROVED INFORMATION ACCESS AND DECISION MAKING: The State of Kansas has outstanding information available to its workforce. However, in almost all cases, the access to this information access is limited to a small set of agency workers. If information access was improved between agencies the state workforce could make better decisions and more effectively support Kansas citizens and businesses.

MODERNIZED TECHNOLOGY AND SUPPORT INFRASTRUCTURE: The investments in IT solutions that have occurred over the last several decades are mostly still in use today. These "legacy" infrastructures require specialized knowledge, tools, and vendor support. Kansas constantly adds on and expands these legacy systems without removing or modifying the old portions of

the system. With the Kansas Information Technology Architecture (KITA) and agency IT architects, Kansas has the opportunity to design and implement solutions statewide. The commitment to an enterprise set of architecture options can be achieved if agencies are not allowed to “opt out” of statewide solutions. KITA can deliver a solid set of targets and solutions that agencies can use that would lead to a dramatic decrease in the cost and complexity associated with the current technical architecture, while still giving agency choices. This modernized infrastructure will bring several benefits in the area of reduced energy costs, decreased carbon footprint for IT data centers, ability to support agency continuity of operation plans, and ability to recover from disaster.

REDUCED COST OF IT OPERATIONS WITH MORE FUNCTIONALITY: The cost of information technology in Kansas has grown at roughly 3% a year for the last ten years. In 2002, Kansas spent \$192 million on IT. In 2010, Kansas spent \$248 million. If the current trend of 3% growth remains stable, in 2020 Kansas will spend \$335 million. The rapid growth of consultant expenses and the growth of host systems are the major contributors to this growth trend. The IT consolidation projects outlined in this study have the potential to help stabilize this growth curve. With the proper leadership, authority, and facilities other states have proven that there can be a substantial cost savings by mandating IT consolidation. If the State of Kansas takes the necessary steps to make IT consolidation successful it could conservatively avoid spending \$350 million dollars in the next 10 years.

Now is the right time for the State of Kansas to pursue IT consolidation. In 2007, the National Association of State Chief Information Officers (NASCIO) contended that 62% of the states are pursuing some type of IT consolidation². Recent conversations with NASCIO and State CIOs lead us to believe the number of states pursuing IT consolidation is now greater. Missouri began consolidation in 2006 by creating a state CIO in charge of all IT in the state. Nebraska began consolidation in 2007 with a Governor’s mandate to centralize email and identity. Indiana began consolidation in 2005 with a customer centric service philosophy and has reduced its cost to provide IT services by 31.7% in five years. California is in the beginning stages of IT consolidation and is focused on the same recommendations this study outlines: data centers, server virtualization, and email.

IT Consolidation is not new in Kansas. This state has a long and successful history of IT consolidation. It began in the 1970’s with the KAN-SAN telephone system, it continued in the 1980’s with mainframe and network consolidation, and in the 1990’s and 2000’s with limited data center consolidation, and centralized Human Resource and Accounting systems. The Judicial Branch’s Full Court system and Legislative Branch’s KLISS application are additional recent successes in consolidating critical applications. Executing the recommendations of this study can help write another successful chapter of IT consolidation in Kansas.

Kansas should begin its next major IT consolidation project by moving towards a common electronic mail and identity solution. As other states have proven, this project is relatively simple to execute and sets the stage for future consolidation projects. A common statewide email solution achieves significant cost savings, reduces needless technology complexity, and makes communication and collaboration within state government easier.

² “Enterprise Data Center Consolidation in the States: Strategies and Business Justification” National Association of State Chief Information Officers. August 2007. Available at: <http://www.nascio.org/publications/documents/NASCIO-EnterpriseDataCenterConsolidation.pdf>

At the same time, two new state-of-the-art data centers should be invested in. It is estimated that the cost of these facilities will be from \$58 to \$96 million. A complete engineering study on data center needs must be completed to get more accurate cost estimates. When the data center facilities are running, the state should aggressively move all computer equipment to these locations using virtualized servers and shared storage whenever possible. With this centralized infrastructure in place, more aggressive IT consolidation strategies like middleware application consolidation can be obtained.

If done successfully, IT consolidation can make the State of Kansas' government run more efficiently, and at the same time serve Kansas' citizens more effectively.

Strategy	Value To Kansas	Upfront Cost	Cost Savings	Employee Impact	Recommendation
Invest in new Data Centers	High	High \$55-95 million	Neutral	Low	Begin Immediately
Server and Storage Virtualization	Medium-High	Medium	Moderate	Medium Some FTE shift to DISC	Continue Agency Server Virtualization Move to DISC centralized service when new Data Centers completed
Electronic Mail and Identity	Medium-High	Medium	Moderate	Medium Some FTE shift to DISC	Begin Immediately Does not require new Data Centers completed
Unified Communications	Medium-High	High	Neutral	Low	DISC continue to move forward on this project
Middleware	Medium	Medium	Moderate	Medium Some FTE shift to DISC	Each solution needs to be planned for, architected, and a road map developed
Desktop Support	High	Low	High	Large Major FTE shift to DISC	Begin Immediately
Network Support	Medium	Low	Low	Some FTE shift	Begin Immediately
Application Development	N/A	None	None	None	Retain Status Quo
Governance	Medium-High	Medium	Low	2-5 new FTE	Begin Immediately

II. HISTORY AND BACKGROUND

Senate Bill 572 authorized the Chief Information Technology Architect (CITA) of the State of Kansas to “evaluate the feasibility of information technology consolidation opportunities.” The focus of the Information Technology (IT) consolidation evaluation is to include “facilities, staff, applications, networks, disaster recovery operations, data centers, access methods, and any other aspect of the state’s information technology architecture.”

Beginning in June of 2010, the CITA facilitated a series of meetings with the IT leaders from state agencies, local governments, and regent institutions³. The goal of these meetings was to get an understanding of the IT landscape in Kansas. As a result, three surveys were developed and sent to state agencies to build on the understanding gained from the facilitated meetings.

During the same timeframe, the CITA also communicated with IT leaders in Missouri, Iowa, Indiana, and Nebraska to learn about their consolidation projects. In addition, they reviewed strategies and recommendations from consolidation activities in other states. Discussions also took place with Gartner and Forrester -- two IT focused research firms -- to get a greater understanding of industry best practices. Finally, discussions with leading technology companies occurred to evaluate their product lines, compare capabilities, and learn about past involvement they have had with other IT consolidation efforts.

The data received from state agencies, the lessons learned from other states, and the research from Forrester and Gartner were analyzed and recommendations for IT Consolidation in Kansas were developed.

The recommendations for IT Consolidations are broken down into the following ten functional areas:

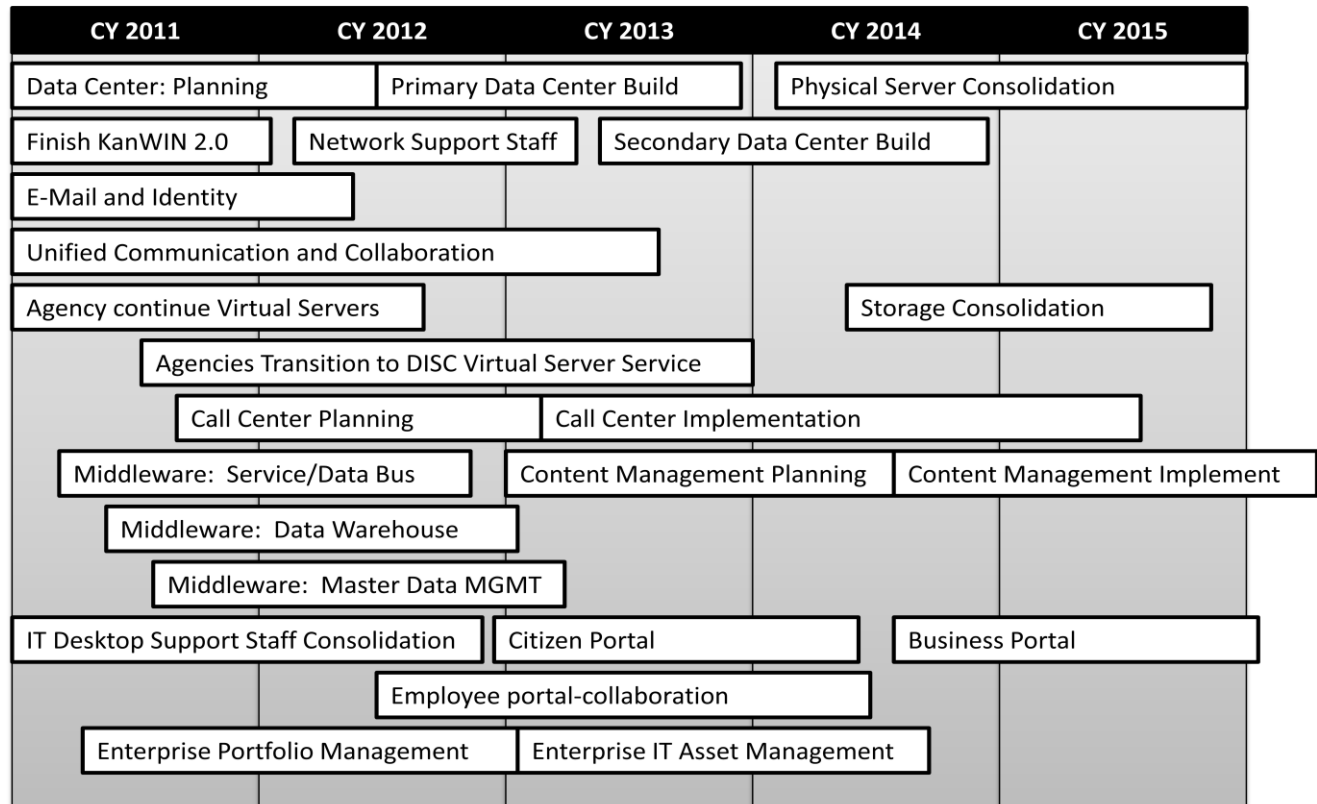
- Data Center
- Servers
- Storage
- Electronic Mail
- Unified Communications and Collaboration
- Identity Management
- Desktop Support
- Network Support
- Other Middleware Applications
- Agency Development Staff

In the following pages, a detailed explanation of each functional area will be articulated. This explanation will include an overview, problems associated with the status quo, scenarios for consideration, and recommendations.

There are many dependencies associated with the different recommendations outlined in this study. The ten functional areas should not be considered ten different, unique, and distinct projects. Scope documents for these projects will be available in the appendix section of this document. Many of the project and initiatives outlined in this study are dependent on each other and for one functional area to have success one or more other functional areas must be completed. These dependences will be

³ A list of the facilitated meetings is available in appendix B.

discussed when appropriate throughout this study. The following chart is a high level roadmap of the projects explained in this study:



The scope of this document is focused on all three branches of government and the regents' institutions. This scope is unique. Other states that have begun consolidation started only with executive branch agencies. The study attempts to outline consolidation that can happen in all three branches and the regents' institutions, but many of the initial strategies, projects, and recommendations only focus on the executive branch.

It is the recommendation of this study that the Judicial and Legislative branches of Kansas government continue to consolidate IT inside their respective branches. The Judicial branch's Full Court application consolidation and the Legislative Branch's KLISS application consolidation are successful consolidation activities and should continue to be built upon. It is also recommended that the Legislative and Judicial branches are active participants in the requirements and design phases of all executive branch consolidation activities happening as a result of this study, with the intention to use the state-wide services when appropriate. Kansas will get the most return on investment when all three branches of government are utilizing statewide shared services.

This study recommends that the universities in Kansas, under the direction of the Board of Regents, work to consolidate IT in each of their respective Universities. Also, universities should continue to pursue collaborative projects with each other.

III. IT CONSOLIDATION STRATEGIES AND RECOMMENDATIONS

From June 1, 2010 to October 1, 2010 the CITA facilitated meetings with state agency IT leaders, administered a survey of state agencies on the IT consolidation topic, researched other state governments' IT consolidation initiatives, and had discussions with IT experts Forrester and Gartner on the topics of IT consolidation. The data obtained was analyzed and used to formulate the following consolidation strategies and recommendations:

DATA CENTERS

Overview and Status Quo: The State of Kansas has its computer infrastructure hosted in a wide variety of locations with varying levels of security, redundancy, and environmental conditions. This variety ranges from highly controlled data centers to standard office space. According to a survey of all state agencies, 53,000 square feet of space is used to host computer equipment in Kansas.

This space is broken down into the following categories:

Type of Space	Number of Facilities	Square Feet	Confidence Factor ⁴
Data Centers	21	45,476	80%
Server Rooms	16	4,538	70%
Wiring Closets	11	837	50%
Other	44	1,228	40%
Total	92	~53,000	70%

Data Center⁵ space is considered the most secure and reliable space for computer equipment because it is specially designed space for the sole purpose of hosting computer equipment. Server Rooms are spaces constructed for computer equipment, but lack the robust infrastructure of data center space. Wiring closets and others spaces are areas in the office that were never intended to host advanced computer systems and pose a large risk to the organization.

Not all data centers are the same. The Uptime Institute, an organization that provides education, consulting, certifications, and leadership for the enterprise data center industry, has developed a tier system for ranking the level of data centers. These tiers take into consideration the amount of uptime the data center can provide. Uptime "is a measure of the time a machine has been up without any downtime."⁶ Higher uptime requires redundancy in the infrastructure of the data center. These components include the network, power, heating, and cooling of the facility. The Uptime Institute's definitions of data center tiers are:

Tier Level	Definition
One	Single path for power and cooling distribution with no redundant components. 99.671% availability. ~\$450 per square foot.
Two	Single path for power and cooling distribution with redundant components.

⁴ Confidence Factor is calculated because several agencies did not respond to the IT consolidation surveys and some other agencies did not provide complete responses. A detailed description of the survey data and respondents is available in Appendix C.

⁵ "Data Center" [Wikipedia](http://en.wikipedia.org/wiki/Data_center). Accessed October 5, 2010. Available at: http://en.wikipedia.org/wiki/Data_center

⁶ "Uptime" [Wikipedia](http://en.wikipedia.org/wiki/Uptime). Accessed October 5, 2010. Available at: <http://en.wikipedia.org/wiki/Uptime>

Tier Level	Definition
Three	99.741% availability. ~\$600 per square foot. Multiple power and cooling distribution paths. These data centers only have one active path with redundant components. ~\$900 per square foot.
Four	Multiple active power and cooling distribution paths, redundant components and fault tolerance. 99.995% availability. ~\$1,100 per square foot. ⁷

State agencies reported in a 2010 survey that there are 21 data centers in State government taking up 45,476 square feet of space. Using the Uptime Institute's Tier ranking those data centers are broken down as follows:

Tier Level	Locations	Square Feet
Four	0	0
Three	0 ⁸	0
Two	1 ⁹	13396
One	20	28262

The current IT infrastructure of the State of Kansas is split between multiple locations with varying access control and support levels.

Problems associated with Status Quo:

Having the State's IT infrastructure spread across many different locations provides a number of problems.

Data centers are not cheap to operate and maintain. In the middle of a recession, capital improvements and investments to data centers are often not a high priority. Maintaining many agency run data centers dilutes the already small amount of money for data center improvements. Money would be more efficiently spent to maintain a smaller number of data centers. This capital improvement issue has been illustrated in the past year in the following two visible events:

- The State's primary Topeka data center had to be powered down last December for required maintenance to the buildings electrical system. Best practice would be to have multiple electrical feeds into the building to avoid the need for the entire data center to be powered down.
- Both the State's primary and secondary Topeka data Centers' uninterruptable power systems (UPS) are running at maximum capacity. These UPS's provide power to equipment if the electricity to the building fails. An agency recently needed to put more equipment in one of those data centers, and before they could install the equipment a \$400,000 upgrade to the UPS had to take place.

⁷ "Data Center Site Infrastructure Tier Standard: Topology" [Uptime Institute, LLC](#). 2010.

⁸ Four data centers were self classified as Tier 3 in surveys, but do not meet Uptime Institute's definition of a Tier 3 data center.

⁹ Four data centers were self classified as Tier 2 in surveys, but do not meet Uptime Institute's definition of a Tier 2 data center.

These two events expose risks in the current IT infrastructure. First, no state data center is fully redundant. Every data center has at least one single point of failure. If a failure occurs in one of those points, the entire data center could go down. State data centers are primarily in facilities that were never built with the intention of being data centers. Second, there are duplicated purchases and maintenance occurring in our infrastructure. Third, staffing 21 different data centers leads to redundant and distributed employees scattered across different agencies and physical locations.

The high cost and maintenance of data centers leads some agencies to use non-data center space to host critical computer systems. These areas can be dedicated “server rooms”, “wiring closets”, or even normal office space. Having critical computer equipment in non-data center areas can lead to a greater risk of service interruption and compromise.

In a 2010 survey conducted for this report, state agencies provided information on the state of their data centers and associated infrastructure. This survey showed the data center infrastructure in the state is aging:

Equipment ¹⁰	Number	Average Age	# >9 years old	Maximum Age
PDU	44	13.3 years	9	40+
UPS	69	5 years	4	18
Generators	18	10.6 years	6	40
Air Handlers	64 ¹¹	16.7 years	13	35

Consolidation Options:

When examining the possibilities for Data Center consolidation these are the different options to consider:

Centralized State data center operation in two facilities

Kansas could look at investing in two data center facilities that could provide the production and backup environments for state agency’s computer equipment. These data centers could be built, leased, or bought. This option builds upon the past success that DISC has achieved in consolidating data centers and providing centralized data services. This option should be sized to include the capabilities that are necessary to cover all branches, all agencies, and all hosted solutions for Kansas.

DISC was asked to provide a rough estimate on the size of any new data centers in 2010 by the Legislative Post Audit. Using a methodology that included looking at current computer equipment, industry trends, and other state facilities DISC determined new data center space requirements are estimated to be:

¹⁰ What is not shown in this table is that the core electrical infrastructure in many of these facilities is greater than fifty years old. This limits the expandability to support modern electrical demands as the core infrastructure and wiring is not able to support these demands.

¹¹ Note that 20 of these 64 air handlers were listed as “unknown” by agency responses.

PRIMARY CENTER		SECONDARY CENTER	
RAISED	14,176	RAISED	11,600
MECHANICAL	3,544	MECHANICAL	2,900
STAFF	4,000	STAFF	2,000
Total sq ft	21,720	Total sq ft	16,500

Determining actual size necessary will require a further study, but this number is a good estimation of data center space needed.

DISC also provided a cost estimate for these new facilities. The cost of this new data center investment is based upon pricing models from various past building projects of this type and scope. These numbers should only be considered estimates.

	Low	Mid	High
Primary	\$17,011,758	\$32,024,634	\$42,529,395
Secondary	\$13,918,711	\$26,201,973	\$34,796,777
TOTAL	\$30,930,469	\$58,226,607	\$77,326,172

There is significant difference between the proposed floor space needed (25,776 square feet) and the current floor space being utilized (53,000 square feet). The difference can be contributed to the following areas:

- Reduction in physical space needed by using best practice server and storage technology
- Reduction in floor space needed by using updated power and cooling technology
- This proposal does not include Regents institutions.

An architectural and engineering analysis of data center needs must occur to get more accurate requirements and cost. There are many unknown issues in the current legacy data center environments, these legacy requirements will need to be taken into account when scoping out the data center project.

Centralized State data center operation in two facilities, regents DR capable

This option is exactly the same as the option presented above but it extends the data center to accommodate the regents institutions using one or both of the data centers as their disaster recovery site¹².

DISC was asked to provide a rough estimate on the size of any new data centers in 2010 by the Legislative Post Audit. Using a methodology that included looking at current computer

¹² This option could also extend to local governments and school districts. In both cases, the actual size of a data center to provide this service is unknown. Further study would be necessary to determine the requirements, feasibility of this option, and if DISC could provide these services legally. What is known is there is support for local government and school districts for this option.

equipment, industry trends, and other state facilities DISC determined that new data centers should be the following sizes:

PRIMARY CENTER		SECONDARY CENTER	
RAISED	21,265	RAISED	17,398
MECHANICAL	5,316	MECHANICAL	4,350
STAFF	4,000	STAFF	2,000
Total sq ft	30,581	Total sq ft	23,748

DISC also provided a cost estimate for these new facilities. The cost of this new data center investment is based upon pricing models from various past building projects of this type and scope. These numbers should only be considered estimates:

	Low	Mid	High
Primary	\$25,517,637	\$48,036,951	\$63,794,092
Secondary	\$20,878,066	\$39,302,960	\$52,195,166
TOTAL	\$46,395,703	\$87,339,911	\$115,989,258

An architectural and engineering analysis of data center needs must occur to get more accurate requirements and cost.

The Regents could also use each other's current data centers as recovery sites. This is a valid alternative since they are all connected using the KanREN network and some universities have available space to host more computer equipment.

Upgrade existing DISC data centers

DISC currently provides data center space in three locations (two in Topeka, one in Wichita). If a data center and server consolidation strategy wanted to leverage the current data center space there would be required upgrades to the Topeka data centers. In order to understand the upgrades required, you must look at the following critical infrastructure areas:

Data Center	Electrical	Floor Space	Air Handling
Topeka I	<i>Upgrade needed to UPS</i>	<i>800 square feet available, with current architecture</i>	<i>Upgrade not needed</i>
Topeka II	<i>Upgrade needed to USP</i>	<i>No space available</i>	<i>Upgrade needed to handle more equipment</i>
Wichita	<i>Upgrade currently not needed</i>	<i>2500 square feet available</i>	<i>Upgrade not needed</i>

There would be a considerable investment needed to fully utilize the unused floor space in the Topeka I data center. Topeka II data center was never built to be a functional "hot-site" data center, but it has evolved over time to be utilized in that fashion and it is currently at capacity. The Wichita data center could be used right now to host more state computer equipment, but hosting primary agency computer equipment in a remote location without onsite staffing leads to administrative challenges when physical maintenance needs to occur to that equipment.

With upgrades to the electrical and UPS systems in the Topeka I data center, there could be opportunities for limited data center and server consolidation. Another option would be to have DISC use the Eisenhower State Office Building data center space for additional limited consolidation opportunities. In a 2010 audit, the Legislative Post Audit agency suggested that DISC use the extra space in the Topeka I data center to build a server virtualization service that small and medium sized agencies could subscribe to. This service could be a beginning step to eliminating some data centers and server rooms. More information on server virtualization will be discussed later in this study.

DISC could also use extra data center space in Topeka I data center to host centralized applications such as eMail for all state agencies to use. This service could be a beginning step to eliminate the redundant eMail systems in state government. More information on eMail and shared application consolidation will be discussed later in this study.

None of these strategies can be fully implemented without upgrades to the existing data center infrastructure. An engineering study on current data centers would be required to determine exact cost of these upgrade. The estimated cost of an UPS upgrade to Topeka I data center would be at least \$500,000. This number is based on a current project to upgrade the UPS system at Topeka II data center.

Outsource the operation of State data centers

A growing trend in IT is to outsource the operations of data centers to third party providers. Many states and private companies are moving to this strategy. According to our research, the successes of these strategies are mixed. While there are some groups claiming significant cost saving associated with outsourcing data center operations, the management of the contracts and cultural complexity makes the management and administration of this solution a huge barrier. Forrester Research recommends that organizations first understand the cost complexities in their current environment before outsourcing.¹³ In most cases, the expected savings are not as great as the actual savings; and in some cases cost more.

There is also resistance to this strategy by state agencies. In a data center survey conducted for this study, outsourcing of state data centers was the least favorable scenario. This is due to the uncertainty of where servers would be hosted in this scenario, and the increased perceived risk of outages, decreased service levels, and security compromises.

Outsourcing of IT is continuing to grow in popularity in the industry. Kansas should not look at outsourcing data center operation at this time due to the reluctance of state agency leaders and the mixed level of success from other states. It is anticipated that data center outsourcing's maturity will continue to grow in the future. When that happens, its feasibility should be reevaluated.

Continue Status Quo

Agencies currently have the option to host their computer equipment in any fashion they wish. This has led to over 100 unique places where computer equipment is being hosted. This strategy could be continued.

¹³ "Best Practices In IT Financial Management" Forrester Research. September 15, 2010.

This option's benefit is that it allows state agencies the most flexibility in determining their needs for their computer equipment. If they want to assume the risk of not having computer equipment in a data center, or if they would rather build their own data center agencies have that option.

Continuing the status quo leads to redundant investments, staffing, and infrastructure. There is no standardization across agencies and it makes visibility on IT investment difficult. As discussed earlier, the current data center and server room makeup in the state has ageing support infrastructure and most of the spaces were never architected to provide critical redundancy. Equipment is nearing its end of life and to continue the approach a considerable amount of money will need to be invested in each agency data center in the near future.

While this strategy is the easiest to manage and administer, continuing on this strategy increases the Kansas' risk to outage.

Recommendations:

The State of Kansas' data center infrastructure is aging, decentralized, and uncoordinated. Multiple unique facilities each with their own staffing, maintenance, and support poses a great risk to Kansas. Continuing the status quo significantly increases the likelihood of major IT system failure.

The current data center infrastructure is not conducive to a robust IT consolidation strategy. The buildings that host our data centers were not constructed with the unique needs of a data center in mind. All current facilities have one or more single point of failure. Many of the key components are aging and will need to be replaced.

The State of Kansas should invest in two new data centers: One primary data center located in the Topeka area, and one secondary data center located on or near one of our universities. Once the data centers are built, all state agencies should begin a transition into these new data centers and abandon their old data center space. Estimated investment needed is approximately \$58 to \$96 million.

The Regent's Universities should consolidate their data center needs into one primary data center per university. They should use other university's data center facilities as disaster recovery locations. Before the statewide secondary data center is architected and designed an investigation should be done with universities, local government and school districts to determine if there is interest for these groups to use a statewide secondary data center. Because of the unique business relationship between the regents institutions, the regents should not be mandated to consolidate in the statewide primary data center.

The upfront cost associated with building, buying, or leasing a data center will be high. This cost will be difficult to justify in the current economic conditions, but having a centralized facility is the cornerstone to more robust IT consolidation initiative. In the current data center infrastructure there is limited capacity to consolidate servers, storage, and applications. The State's current primary data center does not have the UPS capacity to support more equipment, and there are issues with the amount of weight the floors of the data center can handle. The State's current secondary data center does not have the electrical capacity or the floor space to support additional equipment.

Without statewide data centers that have the proper capacity and architecture, it is unlikely that efficiencies and savings could be realized by consolidating servers, storage, and applications. Some

steps toward consolidation could occur without new data centers¹⁴, but the opportunities will be limited and cost savings will be minimal. Providing Kansas with adequate data center space a critical step to achieve consolidation of IT.

SERVERS

Overview and Status Quo:

Servers are pieces of computer equipment that run applications to provide access to essential services¹⁵. The State of Kansas has 4252¹⁶ servers. They are broken down as follows:

Branch	# doing virtual	Planning	# servers	Locations
Executive	17	7	1953	76
Judicial	0	0	12	1
Legislative	1	0	25	2
Regents	6	1	1409	27

There are many different classes of servers. Servers come in all shapes and sizes. The biggest servers are called “mainframe computers”. Mainframe computers are “powerful computers used mainly by large organizations for critical applications”¹⁷. The State of Kansas has one mainframe computer hosted by DISC in Topeka that all state agencies that require mainframe computing use. This consolidation happened in the 1990, resulting in a standard platform, reduced FTE cost, and reduced cost for mainframe services.

Midrange computers are “a class of computer systems which fall in between mainframe computers and microcomputers”¹⁸. The State of Kansas still has many servers that fall into the midrange category. The numbers of midrange servers are not increasing in the state’s current environment. The low cost of microcomputers and blades along with the trends of purchasing off the shelf software and utilizing server virtualization has stunted midrange growth.

Microcomputer servers are high powered computers that resemble what most people will consider a personal computer. They have the same type of construction and components. Blade servers are a type of microcomputer server that removes the physical storage on the server to decrease the physical size of the server. The storage requirement of a blade server is centralized into a Storage Area Network (SAN). Blade servers are often used in server virtualization strategies.

Most of the current growth of servers in Kansas is due to rapid escalation of microcomputer servers and blade servers. The number of servers in state government has grown at a rate of 13% over the last nine years. The following chart shows this growth:

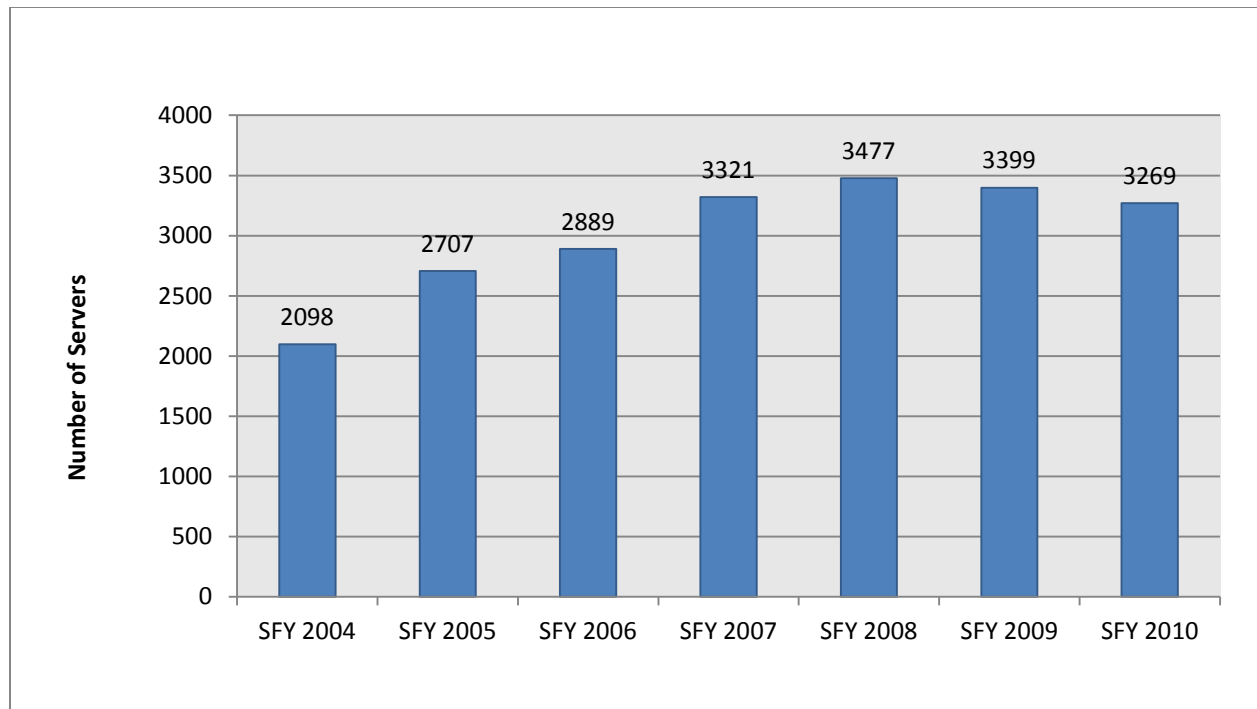
¹⁴ These initiatives include Server Virtualization, Email Consolidation, Identity Management Consolidation, and all enterprise procurement strategies.

¹⁵ “Server (computing)” [Wikipedia](http://en.wikipedia.org/wiki/Server_(computing)). Accessed October 5, 2010. Available at: [http://en.wikipedia.org/wiki/Server_\(computing\)](http://en.wikipedia.org/wiki/Server_(computing))

¹⁶ “Annual Summary of Three-Year IT Management and Budget Plans” [Kansas Information Technology Office](http://da.ks.gov/kito/cita/itmbp/3YR_ITPlans/FY10-12PlanSumm.pdf). January 2010. Available at: http://da.ks.gov/kito/cita/itmbp/3YR_ITPlans/FY10-12PlanSumm.pdf.

¹⁷ “Mainframe Computer” [Wikipedia](http://en.wikipedia.org/wiki/Mainframe_computer). Accessed October 5, 2010. Available at http://en.wikipedia.org/wiki/Mainframe_computer.

¹⁸ “Midrange Computer” [Wikipedia](http://en.wikipedia.org/wiki/Midrange_computer). Accessed October 5, 2010. Available at http://en.wikipedia.org/wiki/Midrange_computer.



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This rapid escalation in server numbers is due, in part, to three major trends in the IT industry. First, the cost of computer equipment continues to decrease, making it more cost effective to deploy servers. Second, the number of server based applications and services have increased dramatically. This increase requires more servers to run the applications. Third, there has been an industry wide transition away from mainframe computing and midlevel computing. All of these trends lead to more utilization of microcomputer servers and blade servers.

As a way to solve the proliferation of new servers, a new server deployment model called server virtualization has been growing in popularity. When you use server virtualization, you use one physical server and divide it into multiple virtual servers. In the last three years the State of Kansas has seen the number of virtualized servers grow from 168 to 983.

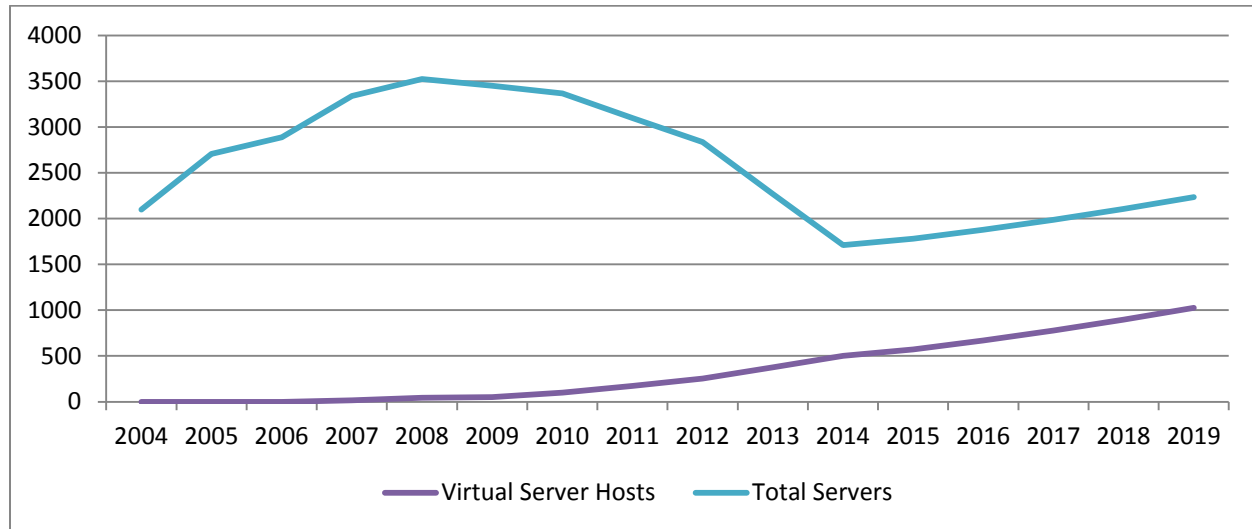
You cannot virtualize every server. Servers that run application with high input/output, like database servers are not usually seen as candidates for virtualization. Some purchased applications do not support their products in a virtualized environment. Domain controllers are also not recommended for virtualization. As virtualization becomes a more mature technology, it is expected that some – if not all – of these issues will be resolved and the majority of microcomputer based servers could run on a virtualized platform.

Problems Associated with Status Quo:

Demand for servers will continue to increase over time. Over the past nine years, servers have grown 13% per year on average. This trend is likely to continue. Virtualization holds some benefits that will allow keeping the cost curve flatter than the server growth curve for a few years. If agencies continue to virtualize their servers at their current rate there will be a point of diminishing return happening in

¹⁹ “Annual Summary of Three-Year IT Management and Budget Plans” Kansas Information Technology Office. January 2010. Available at: http://da.ks.gov/kito/cita/itmbp/3YR_ITPlans/FY10-12PlanSumm.pdf.

FY2014. At this point, the virtualization strategy will reach a saturation point and costs for servers in agencies will begin to escalate without a larger IT consolidation strategy. In short, virtualization currently keeps the cost of server growth in check by allowing for more computing power to be gained from less physical servers, but the demand for servers will outstrip the ability to virtualize servers by FY2014. The following chart shows this curve:



The current server deployment model is not as efficient as it could be. State agencies are hosting their 4252²⁰ servers at over 100 different locations. Administration and maintenance of these servers is distributed across all these agencies. 38 agencies are actively pursuing server virtualization. There are considerable upfront costs associated with virtualization. Specific hardware is required, and personnel need to be trained to effectively utilize virtualization. Having this hardware and personnel spread across many different state agencies is inefficiently using state resources.

Allowing each agency to purchase and deploy their own servers lead to no uniformity in what servers are being run in Kansas. In addition, the state is not leveraging its buying power when purchasing servers. Agencies procure servers in isolation.

Consolidation Options:

Consolidation options for servers fall into one of three categories. The first category is on the location of the physical servers. The second category is on server virtualization. The third category deals with the procurement of servers and could start happening immediately. The location of physical servers option depends entirely on the availability of data center space. Robust centralization of physical servers will require increased data center availability in Kansas. Server virtualization strategies can take place without new data center space and could start happening immediately. When examining the possibilities for Data Center consolidation these are the different options to consider:

Agencies continue to virtualize servers

Virtualization has been a continuing trend in state agencies for the last three years. In that time, virtual servers have grown from 168 to 983. The 2010 audit report from the Legislative Post

²⁰ "Annual Summary of Three-Year IT Management and Budget Plans" Kansas Information Technology Office. January 2010. Available at: <http://da.ks.gov/kito/cita>.

Audit agency estimated \$600,000 in savings have been achieved from server virtualization, and an additional \$979,000 to \$1,300,000 in additional savings could be realized from more server virtualization. Additional benefits from server virtualization include reduced data center space needed to host computer equipment, decreased power consumption, decreased hardware costs, and increased flexibility and agility.

One consolidation option would be for agencies to continue to virtualize all appropriate servers. Agencies that have not begun virtualization could develop a strategy to begin virtualizing all appropriate servers.

DISC provides a Virtual Server service for state agencies to use

In March of 2010, DISC presented to the Information Technology Advisory Board its plans to offer a virtual server service for agencies to use. After this presentation, there were four state agencies that immediately inquired about using the service. At this time DISC has not finalized the service, but they are making steps to start providing this service to agencies soon. DISC has the hardware and software required to provide this service purchased. DISC can begin providing virtual servers to agencies as soon as the service offering is finalized.

When DISC finalizes this service, agencies that have not begun server virtualization could begin to take advantage of this service. This would save state agencies on the upfront costs associated with hardware and software purchases along with the costs associated with training staff on virtualization. Agencies that have started virtualization could look at transitioning to the DISC service when their virtualization hardware is at end of life, or when new investments are needed to their virtualization infrastructure.

All Physical Servers moved immediately to DISC hosted data center

All state agencies could move their servers into statewide data centers if the State of Kansas invest in new modernized data center facilities. This would allow for the current 21 data centers, 16 server rooms, and 55 other sites to be eliminated in a short amount of time. It would also be the only way to make investments in the new data centers economically viable. Having massive amounts of extra space in the new data center, while agencies are paying for inferior data center or server room space elsewhere would be redundant and inefficient use of state resources.

Physical Servers moved incrementally to DISC data center

Another option for physical server consolidation would be to move physical servers and computer equipment incrementally. Once the data centers are running, DISC could develop a roadmap for agencies to transition their servers into the new environment. The most logical time would be when current servers hosted in the agency data center are scheduled for a technology refresh. Instead of installing new servers into the old agency run data centers and server rooms, the servers would be installed in the new centralized data centers.

This option ensures that the old agency server rooms and data centers will be operational for at least five years past the construction of the new statewide data centers. A strategy that prolongs the usage of these aging facilities is not in the best interest of Kansas. The slow transfer of servers to the new data center also causes financial problems in recovering the costs of the new data centers. A large initial customer base is needed to keep rates low for everyone.

Recommendations:

The recommendations for server consolidation are three-fold:

First, agencies should continue to virtualize their servers. The Legislative Post Audit report from 2010 estimates that agencies could save \$979,000 dollars if they continued to virtualize all appropriate servers. This recommendation can and should begin regardless of the state investing in new data center space.

Second, DISC should finalize their Server Virtualization Service as soon as possible. Once finalized, all agencies that have not begun virtualizing their appropriate servers should develop a strategy to utilize the DISC service as soon as possible. When the DISC service is available, all new agency investments in server virtualization hardware and software should be frozen without a waiver from the appropriate branch CITO, and those agencies should transition to the DISC virtual server service. The same LPA report estimated a potential costs savings of \$1,300,000 if agencies used DISC's proposed virtual server service. This recommendation can initially occur regardless of the state investing in new data center space, but will not be able to be fully completed without either upgrades to the current state data centers or investments made into new data centers.

Third, all state agency computer equipment should be immediately moved into the new state primary and/or secondary data centers when they are completed. Individual agency data centers and server rooms should be phased out. No new agency investments should be made in agency data center and server rooms without a waiver from the appropriate branch CITO. This recommendation assumes that the state invests in new modernized data centers as outlined in this study.

STORAGE

Overview and Status Quo:

The storage capabilities in Kansas are similar to other public and private sector organizations. When Kansas was primarily operating mainframe-based solutions, storage was primarily disk and tape directly attached to the mainframe. Backup solutions were tape-based, and the backup tapes were sent off site for storage. Recovery was accomplished by sending the tapes to alternative mainframe sites and used to reinstall applications and data.

When agencies started moving toward server-based architectures, storage was kept very close to the server. It was either physically a part of the server or in the same rack. This closeness was due, in part, to vendor capabilities and performance benefits. Networks, at that time, provided the biggest bottleneck.

Storage demands continued to grow steadily, and as servers ran out of locally attached storage there was a transition to Network Attached Storage (NAS) and Storage Area Networks (SAN). This transition helped minimize the escalating cost of storage upgrades. Backups occur using tape, but can also be accomplished by replicating the data in the SAN or NAS in another location. SAN environments are expensive, require specialized skills to manage, and need a large server base to make economically viable.

The State of Kansas owns a huge amount of data. Overall, there is in excess of 1.2 petabytes²¹ of data in state government. Agencies are estimating that data is growing between 10% and 40% per year in their agencies. Forrester is seeing 30% to 50% percent growth across all organizations.²² If this growth pattern continues the state will be responsible for 5 to 8 petabytes of data in 2015, with the majority of that data being unstructured content.

These 1.2 petabytes²³ of data are stored in a wide variety of solutions. State agencies reported over 68 different unique storage devices running in the current environment. Due to incomplete survey results and participation, it is estimated that the actual number of storage devices running is over 200 and over 2 petabytes of total storage capability.

The following is a breakdown of the amount of data stored in state government:

Branch	Terabytes of Data	# units	Average age
Executive	832	45	2.5
Judicial	5	2	5
Legislative	85	6	3.5
Regents	344	15	2

Agencies have reported that nine different vendors are providing 66 different SAN environments in Kansas. Agencies have also reported that they are seven different vendors providing nine different NAS solutions. Additionally, there are eighteen different tape backup solutions. Each agency has a their own storage and backup environment. They vary in size, capacity, and age.²⁴ It is unknown how many FTE are involved in the management and administration of these redundant storage environments. The perception exists that most large and many medium sized agencies have dedicated staff assigned to storage management and administration. The smaller agencies either use partial FTEs or outsource their storage administration.

Storage Types / Manufacturer	# of	Raw Capacity (TB) - reported
NETWORK ATTACHED STORAGE (NAS)		
Buffalo	1	4
EMC	1	
Lacie	1	1
Microtech	1	1.4
NetGear	2	8
SUN	1	2.314
Data Domain	2	32
STORAGE AREA NETWORKS (SAN)		
Dell	15	205.15
DNF	2	26
ecologic	1	5

²¹ A petabyte is 1,000 terabytes or 1,000,000 gigabytes.

²² Andrew Reichman. "How Efficient Is Your Storage Environment?" [Forrester Research](#). October 22, 2009.

²³ This number does not include tape backup systems.

²⁴ See Appendix C for details.

Storage Types / Manufacturer	# of	Raw Capacity (TB) - reported
EMC	14	218.6
EqualLogic	3	80
HP	2	15
SUN	9	71.314
Xiotech	18	530.609
Cisco	2	
Virtual Library System		
HP	1	59.98

DISC has the ability to provide data as a service to state agencies. They host a SAN in Topeka which has 48 terabytes of capacity. In addition to the raw storage capability, DISC also has a data de-duplication service and a backup management solution. They can replicate data and storage environments between all three DISC managed data centers. The cost of fully managed storage is \$0.002 per megabyte per month.

Problems associated with Status Quo:

There are problems that arise when multiple agencies are all involved in purchasing, deploying, managing, and administering the same technical solution. Maintaining compatibility between devices is a constant battle in these situations. Recovery capability must be developed and tested for each of the solutions. Duplicated effort concerning patch management and firmware upgrades happen. Growth must be accounted for in each environment leading to the right size for each individual solution, but this leads to dramatic overbuild in the enterprise. Bandwidth needs are increased to accommodate each agency's backup and recovery solution.

The current system allows for a duplication of talent and skills across state agencies. Each vendor-supplied solution requires different training, management tools, and hardware. So investments are being duplicated by agencies to get their agency to a level of maturity necessary to provide NAS and SAN solutions for their agencies. Also, each independent storage solution requires skills to utilize it properly in the different environments running in agencies. The different technical components of the state's architecture (operating systems, databases, networks, and security solutions) add complexity to the environment that require great knowledge. Keeping all the components up to date and synced over time is a constant challenge. Critical staff attrition is a huge risk in these agency-by-agency models. If the agency expert on storage leaves the agency, there is a high likelihood of service interruption.

Kansas currently has a significant number of products deployed for storage. When agencies purchase products in isolation the state does not leverage its buying power in the most effective manner. Joint purchases between agencies do happen, but this practice is an exception rather than the norm. New technology purchases are often linked to a new application or a new IT project. Some applications and solutions work better with certain vendors' storage equipment. As a result, line of business application and the storage infrastructure are sometimes packaged together. This is how multiple storage solutions can be present in the same agency. Allowing these purchases to be done individually by agencies is more expensive to the state over time.

Agency purchases of SAN and NAS solutions also lead to duplicated equipment. For SAN and NAS to be most effective, recoverable, and secure there needs to be a mirrored deployment of the equipment. This means there must be two identical SANs: one primary SAN and one secondary SAN at a remote location. If one fails, you have a replicated second SAN that can be used. Most agencies are not able to have a fully redundant SAN environment. They are running a single storage solution and depend on tape backup for recovery. In this environment, recovering from a failure is a long and hard process. It takes time for the new SAN to be shipped, installed, configured, and loaded. After this happens restoring applications and data can begin. Unique devices in agencies put the enterprise at more risk for downtime.

Consolidation Options:

Consolidation options for storage are highly dependent on server strategy and network capability. It is possible to consolidate storage independently of consolidating servers if the network is capable of handling the traffic demands of servers running in one location and the storage running in another location. While possible, this is not a best practice and should be avoided. Servers should be hosted in the same data center that is providing storage for those servers.

Continue State Quo

Agencies can continue to find the best storage strategy for their technical architecture and negotiate for tools and products as necessary. Retaining the status quo allows the greatest flexibility for agency initiatives. Agencies perceive this as the option with the least amount of risk. But agency demands for data often outstrips the budget available for increased storage. This puts into place an unsustainable storage architecture that will need increased expenditures to maintain. If agencies fail to adequately fund the storage expansion there will be a risk of data outages, loss, and/or compromise. A more economical storage solution is needed.

The increased agency flexibility of the status quo leads to uncoordinated backup and recovery processes, provides integration challenges due to the wide variety of often incompatible solutions, and knowledge that cannot be transferred from one agency to another.

Purchasing storage in smaller units will keep storage costs high, and will not provide the economies of scale that an enterprise deployment could bring. Small and medium sized agencies will continue to have a hard time justifying the purchase of their own SAN technology and the ones that do will continue to have a difficult time keeping the technology maintained and up to date.

Even with the KITA establishing targets for storage components, agency approaches likely will not change in the status quo.

DISC provide central SAN access

DISC has a history of providing storage and integrating storage solutions to agency applications and technical architecture. They currently provide SAN storage to three agencies. But, the amount of storage that will be needed in a consolidated environment is at least ten times greater than what DISC is currently managing. This massive increase in storage capacity will require dedicated skills and more staff dedicated to storage management. However, consolidating storage will allow the state to leverage its full buying power and should drive

down the overall cost of storage. Other states have seen up to a 50% drop in storage costs over a five year period in a consolidated environment.

The biggest challenge under this approach will be connecting the consolidated storage environment to the current application portfolio that exists in Kansas. These applications are running on servers distributed across 100 different locations in Kansas. Storage consolidation strategies go hand-in-hand with physical server consolidation and virtual server projects. When servers are moved into the centralized data center they should be considered candidates for using the consolidated storage environment.

IT employees that are experienced at managing storage exist in state government today. The expertise is spread out across many of our agencies. These experienced employees must be brought together as a single team and leveraged to deploy and manage storage for the enterprise.

Purchasing and contracting to leverage buying power

The state could establish upgrade and replacement cycles based upon the agencies aging storage devices and funded replacements. This could be the basis of storage product purchasing and negotiations and could be successful if agencies agreed to utilize the agreed upon solutions. But, if those solutions would have to be implementable within technical architecture in the different agencies. The current approach of using the products under contract only as an option will not get the best pricing and product scale that is needed to make this approach viable.

Recommendations:

DISC should provide central SAN access for all state agencies. This solutions should be architected with multiples tiers of storage to give agencies choices. Storage services should be provided from more than one vendor to avoid lock in.²⁵ The solution should be redundant and replicated to eliminate failure risks. All agency investments on SANs (including new purchases and expansions) should be frozen when DISC is ready to roll out this expanded storage solution. Agencies should be allowed to continue to run their current storage environment until it becomes end of life or a new investment is required. At that time, agencies should transition to the consolidated storage solution. Storage management professionals and technicians should be transferred to DISC when the agency is transitioning to the consolidated service.

It is recommended that this service has a governance body created to oversee the requirements, development, and pricing of the service and to manage the service's growth and evolution.

It is important to note that some agencies have storage uniquely configured to support a specific application or line of business²⁶. Often this is due to specific funding sources and federal guidelines. However, other states have found that with a combination of policies, procedures, and transparency that all of these issues can be solved.

²⁵ Andrew Reichman. "How Efficient Is Your Storage Environment?" [Forrester Research](#). October 22, 2009.

²⁶ For example, Public Safety, Health, Education.

ELECTRONIC MAIL

Overview and Status Quo:

Electronic mail is the most popular way of inter and intra office communication. Gartner contends that email and other types of unstructured content will continue to grow.²⁷

The email in Kansas is currently managed in multiple different environments. There are at least 32 different email environments being operated in Kansas government. Agencies reported that 13 to 20 employees serve as email administrators across Kansas. The annual cost to maintain these environments is unknown.

Microsoft Exchange is the most popular email server. 23 agencies are using Exchange and 2 agencies have current or planned projects to move toward Exchange. 2 agencies are using Lotus Notes and 3 agencies are using Novell GroupWise. GroupWise and Notes are considered “twilight” products according to the most current Kansas Information Technology Architecture²⁸. This means GroupWise and Notes should be considered end of life and no new investments should be made on those products. Six agencies are using other email platforms. Finally, there are two agencies that have a company outside of state government hosting their email in a “cloud” service.

DISC currently hosts 27 agencies’ email. They are one of the agencies using Microsoft Exchange. DISC’s email customers are mostly small agencies who do not want to take on the task of maintaining their own email environment. Most medium and large sized agencies host their own email services. In the last couple of years, some state agencies have considered using “cloud” based email services offered by companies like Microsoft and Google. Agencies no longer have to worry about maintaining their email environment. Google, Microsoft and/or other companies do that for them. DISC had never considered hosting medium and larger agencies emails, but they are now currently building the infrastructure to be able to provide this service to all state agencies.

Problems Associated with Status Quo:

Running separate agency email systems leads to redundant purchases, duplicated staffing, and inefficient communication.

Maintaining an email system is costly. A survey of state agencies conducted in 2010 concluded that what email is costing to the state is unknown, but it takes at least 9 to 20 employees to maintain. Cost is unknown due to not having specific guidelines for cost determination, including hardware, software, employee, and vendor costs. These costs include hardware and software that is being purchased for each agency system to provide the email service and also other additional applications to enhance security, provide email archiving, and other protection against spam and anti-virus. There is no uniformity in product choices between agencies and this adds unneeded complexity to the state email environment.

In 2003, Governor Sibelius wanted to send an email to all state employees. This was not possible with all the different email systems. DISC started a project to make a common email directory so the

²⁷ “2009 U.S. Data Center Polling Results: How Users Are Evaluating and Deploying Emerging Storage Architectures and Technologies”. Gartner Research. March 9, 2010.

²⁸ “Kansas Information Technology Architecture Version 11.2” Kansas Information Technology Office. July 2009. Available at: http://da.ks.gov/kito/cita/documents/KITA_Ver11.2_Final4.pdf.

governor could send an all-state employee email. Because the current email environment is federated and spread out in all agencies this was a difficult project. Even as of today the initial vision has not been accomplished.

In 2007 the Governor of Nebraska, Dave Heineman, realized that having multiple agency email systems was a problem. Not having a uniform naming convention for all state employee in Nebraska caused confusion when citizens and businesses wanted to email employees. For instance, Kansas Department of Administration's email addresses are firstname.lastname@da.ks.gov while the Kansas Secretary of State's email addresses are firstname@kssos.org and the Kansas Department of Transportation emails are firstnamelastinitial@ksdot.org. This was also a big issue in Nebraska. Governor Heineman wanted all emails for state employees to be firstname.lastname@nebraska.gov because when you interacted with a state employee you were dealing with the State of Nebraska not an individual agency.

Consolidation Options:

Continue Status Quo

The State of Kansas could continue to provide email on an agency-by-agency basis. This allows the greatest flexibility to agencies. They can determine what features are important to them and they can control their environments.

Email systems are getting more expensive to run due to the increased requirements of email, including e-discovery, anti-spam, and anti-virus needs. These requirements need dedicated staff and dedicated hardware. The increased overhead associated with running email is causing more agencies to consider moving to a cloud based outsourced email model. Continuing the status quo will see more agencies moving to cloud based or hosted services for email.

If the status quo is maintained, DISC needs to develop a per-mailbox email service for all state agencies to utilize. DISC needs to give agencies an additional option to third-party organizations cloud based email services.

Centralize all e-mail

The State of Kansas could centralize all email into one primary and one secondary email environment maintained and managed by DISC. It would require proper architecture, governance, and policies. Other states have proven that this can be a successful project. The issues related to centralized email have been overcome.

Outsource state email

The State of Kansas could outsource all state email. This would require contracting with a company like Microsoft or Google to maintain and manage all aspects of the email environment. Leveraging the size and economies of scale of the outsourcing organizations help to drive down the cost per mailbox of supporting email. This makes outsourcing email a low cost, attractive option. On the other hand, outsourcing opens a number of possible problems. First, state email will be stored in multiple locations around the country, rather than in Kansas. Second, it is uncertain how responsive cloud email providers will be if a legal hold is put on state email via an e-discovery request. Third, the migration from federated email to cloud email will be a substantial challenge. Each agency would have to migrate their systems.

Recommendations:

The State of Kansas should consolidate all executive branch email systems into one centrally managed system. DISC should build the infrastructure necessary to support one statewide email system. This includes the email servers, spam filters, e-discovery software, and all other necessary core infrastructure. The solution should be designed to allow for state agency personnel flexibility in provisioning their own email accounts and other lightweight email administration. Executive branch agencies should be the first agencies transitioned to the centralized email system. After successful migration of executive branch agencies, the legislative and judicial branches should evaluate using the centralized system.

The first consolidation project that Nebraska, Missouri, and Indiana underwent was to centralize their email systems. It took Nebraska 18 months to complete this project. Nebraska moved to two environments (one primary and one secondary). They run the new centralized email environments with five full time employees. Technical and financial benefits of email consolidation in Nebraska include:

- Moving from multiple platforms to one standard platform
- Technical staff no longer spending time resolving conflicts stemming from linking multiple independent systems
- Backup, security, and disaster recovery capabilities handled as a daily function of business and no longer dependent on agency-by-agency policies.
- Easier restoration and recovery of email
- Avoiding costly replacement of old agency email systems
- Consolidate purchases to ensure favorable pricing
- Decreasing total number of FTE used to administer email
- Fewer servers to run email and a smaller carbon footprint²⁹

Indiana and Missouri have similar success stories with email consolidation. Email consolidation was a high profile, but relatively simple first step towards consolidation. Having a quick consolidation success helped gain buy-in from state agencies, and gave the central IT organizations knowledge and experience on how to conduct consolidation projects.

All three states illustrate that this is a feasible project that should be done for cost savings and increased citizen access to government. Like the other three states, Kansas' first IT consolidation project should be to centralized email. This project can happen without any other IT consolidation activities.

UNIFED COMMUNICATION AND COLABORATION

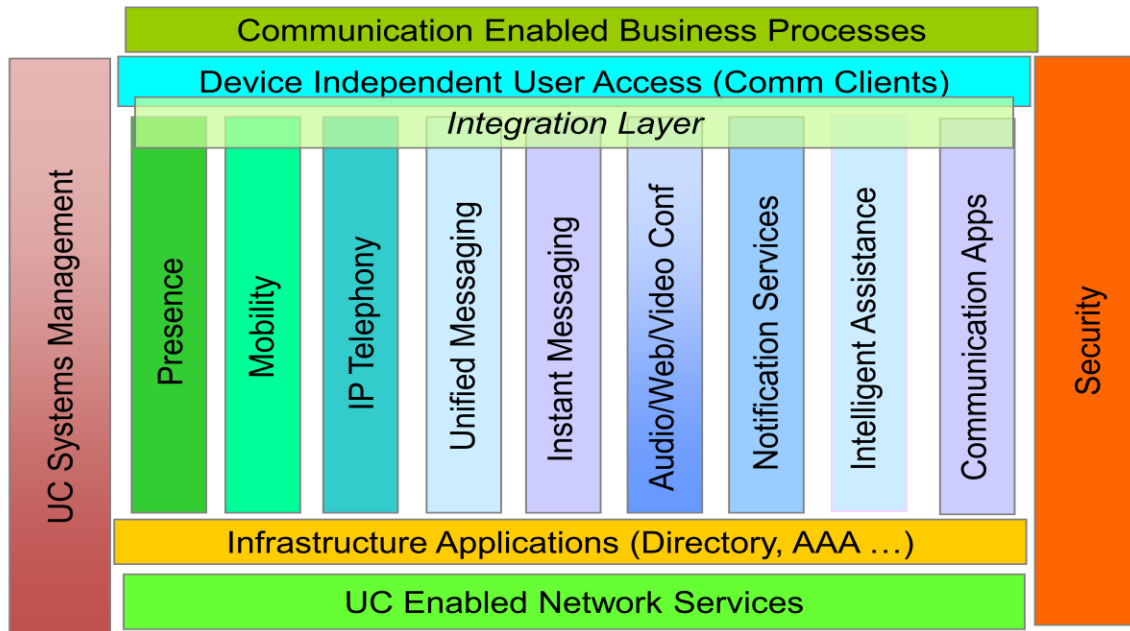
Overview and Status Quo:

The State of Kansas has a centralized phone system for the Topeka campus provided by DISC, all other government locations must obtain their phone service from local providers. This model has a chance to change with a current project to move the state to a unified communications and collaboration platform (UCC). UCC is a set of technologies that work together to integrate real time communication and non-real time communication. UCC is not a single product, but a set of products that provides a consistent unified user interface and user experience across multiple devices and media types. The following chart from Gartner shows what technologies are usually included in UCC discussions:

²⁹ "Enterprise Exchange Email" [Nebraska Office of the Chief Information Officer](#).

Alternate Analysis

UC Reference Architecture: Functional View



A number of drivers aided movement toward UCC. First, analog phone systems were being replaced by digital phone systems. Second, PBX and voice mail systems were nearing end-of-life. Third, employees and citizens were demanding better tools for communication and collaboration.

Some state agencies have been deploying solutions that would be considered UCC technology. There are even some agencies that have built mature practices around UCC technologies. For instance, the use of web meetings and conference calling has saved the state tremendous amounts of money on travel expenses. Voice Over IP (VOIP) has been installed in our universities which has saved money on phone support. Using Instant Messaging (IM) in the office environment has helped speed up communication and has aided cross-agency decision making.

In early 2010, DISC partnered with the Kansas Department of Social and Rehabilitation Services (SRS) to deploy an enterprise pilot of UCC. A multiagency advisory committee comprised of all three branches of government has guided this effort. The goal of this pilot project is to create a UCC service that can be rolled out to all of Kansas government.

Problems Associated with Status Quo:

The status quo allows each agency to deploy various UCC technologies independently. It would then fall on DISC to integrate all the different products together to ensure seamless cross agency collaboration and communication. These complexities would be expensive to manage. Allowing multiple different UCC technologies in Kansas would be of no benefit to the enterprise. While agencies may get a cost effective solution for their agency, the cost to integrate these federated systems would lead to a higher overall price for the enterprise.

Many agencies are facing a critical point because current PBX equipment is becoming end-of-life which will require them to upgrade to a new solution. If these upgrade investments are made in isolation there is a high likelihood they will not be compatible with the state's UCC deployment.

Consolidation Options:

Allow Every Agency and/or Facility to Choose own Solutions

Each agency could continue to use separate phone and data networks in their facilities. This would allow them to get the exact functionality they need at hopefully an attractive price. Some facilities costs to provide service to their customers and employees will be lower than others based on their requirements and the competition that exists in the local market. Since each UCC technology usually requires their own servers and infrastructure, having multiple agencies deploy UCC solutions could lead to major redundancy and more overall servers in the enterprise.

DISC Provide Common UCC technology for all Kansas Government

Under this option, DISC would be the lead agency in developing a solution that could be used by all of Kansas Government. DISC would build, deploy, and support this solution. When supported by a solid network infrastructure, UCC technologies can easily scale to the volume and geographic needs of the state work force. Bringing all of these solutions in together by one central organization will make them easier to support, and less costly to maintain. Kansas will avoid interconnection and incompatibility challenges associated with using multiple UCC vendors. This consistent UCC architecture can be leveraged to expand on other enterprise applications like Customer Relationship Management and call center solutions. A single, redundant, and recoverable UCC solution would be the most cost effective and most reliable option for Kansas.

Contract with third party vendors to provide UCC solutions to state agencies

If DISC does not provide the UCC solution for all agencies, at very least there must be some common solutions used by state government entities. This standardization will make seamless communication and collaboration between agencies more possible. This option should be constantly revalued and researched. Industry best practice is to bring your enterprise together on a single common solution, but after a common solution is used by the enterprise, organizations can then look at alternative solutions and support models.

Recommendations:

The state should move forward with DISC's current UCC project. The project's goal is to provide common UCC technologies for all state agencies. This common solution gives the state a tremendous foundation to build additional services on. Agencies will be able to collaborate better with each other, reduce overall communication costs, and integrate traditional voice services with other communication offerings. All of these benefits will revolutionize the way state government interacts with each other and with its businesses and citizens. This capability will enable a new generation of employees to be the most effective and efficient.

In order for this recommendation to be successful other components of this feasibility study also must be accomplished. KANWIN must complete its upgrade in order to support UCC. The state must also

develop a common identity management framework that can identify and authorize employees access to UCC technologies. Email consolidation would make the integration of voice, voice mail, mobile devices, and email easier to accomplish.

Pilot projects are needed in these areas before they can be deployed to the enterprise. The skills and knowledge needed to support this type of solution will require additional training. Architecture and engineering work must continue to occur, and the state needs to stay up to date on where the industry is evolving. Skill development needs to be a priority.

IDENTITY

Overview and Status Quo: Agencies have gone through several generations of identity management technologies over the decades. The first generation occurred on the Mainframe, and many of these solutions are still running in Kansas. The next generation occurred with servers and server databases that all had unique identification requirements. Software licensing models included “named” users. The third generation occurred with the evolution of the personal computer and the ability for users to connect to larger networks. Novell Netware and Active Directory were the popular directory services used in this environment.

Today, a mix of all these identity technologies exists in Kansas. The Kansas Information Technology Architecture show that Microsoft Active Directory and LDAP are the most popular identification technologies in the state, but there are many other products being used:

38. Definition: Authentication / Single Sign-On refers to a method that provides users with the ability to log in one time, getting authenticated access to all their applications and resources Authentication / Single Sign-On Products						
	Twilight	Current	Emerging	Target	Don't Know	Response Count
LDAP	5.9% (1)	82.4% (14)	11.8% (2)	17.6% (3)	0.0% (0)	17
Active Directory	5.0% (1)	80.0% (16)	5.0% (1)	20.0% (4)	10.0% (2)	20
Sungard CPIP	0.0% (0)	8.3% (1)	0.0% (0)	0.0% (0)	91.7% (11)	12
Sun LDAP	0.0% (0)	30.8% (4)	0.0% (0)	0.0% (0)	69.2% (9)	13
Central Authentication Service (CAS)	0.0% (0)	38.5% (5)	0.0% (0)	0.0% (0)	61.5% (8)	13
SharePoint SSO	0.0% (0)	38.5% (5)	7.7% (1)	7.7% (1)	53.8% (7)	13
Stone Ware Web Network	0.0% (0)	15.4% (2)	0.0% (0)	0.0% (0)	84.6% (11)	13
RSA SecurID	0.0% (0)	53.3% (8)	0.0% (0)	0.0% (0)	46.7% (7)	15
Microsoft NAS and CAVU e-license	0.0% (0)	15.4% (2)	7.7% (1)	7.7% (1)	84.6% (11)	13
Novell Servers	71.4% (10)	21.4% (3)	0.0% (0)	0.0% (0)	14.3% (2)	14

The focus of many of these authentication and Identification systems is to provide directory services. The following is the results of KITA survey on Directory integration products:

43. Directory Integration Products						
	Twilight	Current	Emerging	Target	Don't Know	Response Count
ILM	0.0% (0)	10.0% (1)	0.0% (0)	0.0% (0)	90.0% (9)	10
Microsoft Windows Server 2003	35.3% (6)	47.1% (8)	5.9% (1)	5.9% (1)	17.6% (3)	17
Oracle OID	0.0% (0)	36.4% (4)	0.0% (0)	0.0% (0)	63.6% (7)	11
Microsoft Windows Active Directory	0.0% (0)	82.4% (14)	5.9% (1)	29.4% (5)	11.8% (2)	17
Sun iPlanet	11.1% (1)	11.1% (1)	0.0% (0)	0.0% (0)	77.8% (7)	9
LDAP	0.0% (0)	73.3% (11)	6.7% (1)	6.7% (1)	20.0% (3)	15
Open LDAP Directory	0.0% (0)	61.5% (8)	0.0% (0)	0.0% (0)	38.5% (5)	13
Novell eDirectory	54.5% (6)	36.4% (4)	0.0% (0)	0.0% (0)	18.2% (2)	11
Novell Identity Manager	45.5% (5)	18.2% (2)	0.0% (0)	0.0% (0)	36.4% (4)	11
Oracle Internet Directory	9.1% (1)	27.3% (3)	0.0% (0)	0.0% (0)	63.6% (7)	11
Novell OES 1 Netware 6.5	70.0% (7)	10.0% (1)	0.0% (0)	0.0% (0)	30.0% (3)	10
Microsoft Exchange	5.9% (1)	70.6% (12)	5.9% (1)	11.8% (2)	23.5% (4)	17
Other (please specify)						0
answered question						19

Forrester contends that AD has remained the backbone of identity infrastructure for the last decade³⁰ and it has grown to be an enterprise-class directory used by many organizations as their primary directory.³¹

Agencies that are using Active Directory each have their own Active Directory implementation to authenticate its users. This AD implementation may include agency staff, contractors, temporary staff, business partners, and/or clients. There are several dozen AD implementations running in Kansas today.

Kansas has an official governance committee dedicated to identity management. The Information Technology Identity Management Workgroup (ITIMG) is chartered by the ITEC and is chaired by the Secretary of State's Office. This group has implemented one specific identity management technology, called Public Key Infrastructure (PKI), which is used in Kansas government. PKI is a technology that uses digital signatures and certificates to provide high level of trust in communication. Kansas PKI has been authorized to work with the Federal Government's PKI system, and can be used as a bridge to communication with any other PKI system that is also authorized to communicate with the Federal Government's PKI system. Kansas PKI has been recommended by the Kansas eHealth Advisory Council (eHAC) for use as the identity management technology for the Kansas Health Information Exchange project.

³⁰ "Active Directory Q&A: Demand Rises" [Forrester Research](#). August 11, 2009.

³¹ "The Forrester Wave: Active Directory Management Solutions, Q4 2007" [Forrester Research](#). December 6, 2007

Problems Associated with Status Quo:

Active Directory environments in agencies lack a consistent approach. This makes data exchange between agencies difficult. This difficulty became apparent when the state attempted to extract data from agency AD environments to load email information into the statewide Human Resources system. If an employee needs information from five different agencies, it will require five different user accounts on each system to get the needed access. Making this task even harder is each agency has different username standards, password policies, timeouts, and restrictions. The National Association of State CIOs identified authentication as a major problem in government information sharing in a 2004 report³².

Since cross agency information sharing must still take place, manual methods for employees to share information become commonplace. This often happens by one agency copying its data to another agency. It then becomes the second agency's task to ensure the data is accessed properly and is secured. This not only creates a security risk, but also creates redundant information, increased costs due to data replication and movement, and inconsistent reporting due to data extraction differences.

The scope of the identity issue encompasses four main entities:

- Employees of state government
- Businesses that do business in Kansas
- Citizens that interact with state government
- Other governmental entities (federal, other states, local)

Every agency is charged to implement their own identity management, with no standards or strategies on a statewide level. This means there is no connection between centralized applications (like human resources and accounting) and agency domain access. There are different usernames and passwords in both environments. Also, there is no connection between physical facility access and digital access. State of Kansas employees have a myriad of different usernames and passwords to manage and remember.

This lack of identity management also has an effect on businesses in Kansas. Since every agency and -- often times -- applications have different identity management mechanisms a single business can have over a dozen different identities in state systems. These are systems they access throughout the year for different reasons. The Secretary of State and the Department of Revenue are using the statewide PKI service to help decrease this complexity to businesses by standardizing on a single identity solution. Use of this service is not widespread and should be considered exceptions, not the rule in Kansas.

Individuals have access with state agencies and have the same identity issues of employees and businesses. If an individual has multiple interactions with state services, they probably have multiple identities associated with them in state applications.

Local government employees have the same challenge as state employees since they work on State systems. Replicating all of these identity management capabilities across all of the local government entities in Kansas is costly and ineffective. It leaves the local government with a greater risk for fraud and abuse.

³² "Who Are You? I Really Wanna Know: E-Authentication and its Privacy Implications" [National Association of State Chief Information Officers](#). December 2004.

Having different identity solutions in individual agencies causes confusion to our employees, businesses, and citizens. In 2007, the Chief Information Technology Architect conducted focus groups with citizens, business leaders, and IT leaders in Hays, Liberal, Overland Park, and Wichita for the Strategic Information Management Plan³³. In those discussions, the participants commented that the multiple different connection points into state government was troubling. It made dealing with the state more complex, more frustrating, and slow. This causes them to reenter the same information multiple times for multiple agencies. This causes confusion to our citizens trying to get services, redundant entry of data, multiple identities, and decreased level services to our citizens³⁴.

Consolidation Options:

Continue Status Quo

Agencies would be responsible for their own identity management. This option gives agencies the full flexibility to solve their own identity issues. It also allows all the existing problems of the status quo to continue. Innovation will occur at the agency level. Cost over time will be greater in this option.

Cloud Based Identity Solution

Use a third-party identity solution hosted in the “cloud”. This option would hand off the administration and management of the identity management for Kansas to a vendor. It would leverage their expertise, and Kansas would only have to subscribe to the service. At this time these hosted or cloud-based identity solutions are not perceived to be stable enough for statewide adoption. This option should be revisited in three to five years.

One Statewide Identity Management Solution for Employees

Kansas could move to one statewide identity management solution³⁵. This could be done in a number of ways using different technologies. Establishing a oversight group to assist with this transformation and to define the enterprise role model structure for information sharing would be essential to this option.

One Statewide Identity Management Solution for Businesses

Leverage the knowledge that exists with the Kansas Business Center and develop a roadmap to accomplish their vision of a collaborative business portal. This option will support an enterprise view of documentation and reduce the complexity and silos that exist in the current support of Kansas businesses. The ITIMG should continue to develop their risk matrix and determine a limited set of identity solutions that all agencies should use for government to business interactions.

³³ “Strategic Information Management Plan” Kansas Information Technology Office. January 2008. Available at: http://da.ks.gov/kito/cita/simpln/SIMPLAN_2008_Final.pdf.

³⁴ “Who Are You? I Really Wanna Know: E-Authentication and its Privacy Implications” National Association of State Chief Information Officers. December 2004.

³⁵ While it is perceived that the solution described above will support all employees, it is recommended that the oversight group conduct various pilot projects and do full analysis to develop a holistic State Employee identity management plan and product roadmap.

Expand all Statewide Identity Management Solutions to Local Government

This option would require Kansas to implement a common identity management solution. It could then be extended to the local government entities in Kansas. If this option is preferable, local government should be included in the requirements and design phases of the statewide identity management solution.

One Statewide Identity Management Solution for Individuals and Citizens

This is not a new concept. The Federal government's REAL-ID program is an example of a nationwide identity management solution. Like the other identity management solutions, there should be a statewide direction, and the ITIMG should oversee the development of this solution.

Recommendations:

The State of Kansas should consolidate into one centralized Active Directory (AD) system for all executive branch state agencies. This solution should be architected to allow for agencies the ability to add, modify, and change their own employees. This centralized AD architecture is a Gartner recommendation and industry best practice.³⁶ Regent Universities, Legislative, and Judicial branches of government should consider using the centralized AD solution once the executive branch is fully migrated to the new solution. This project should occur regardless of any other IT consolidation strategy. All state exchanges with local government, business, individuals and federal government should use the Kansas PKI solution.

The State should move toward a HSPD 12- type of model for all employees, contractors, temporary staffing and contract employees. Kansas should also establish a strategy and roadmap for single-sign on and other application authorization topics. The ITIMG should lead both of these projects.

The State should charge the Kansas Business Center and the IT Identity Management Workgroup to create a roadmap outlining a common approach to government-to-business exchanges including how to share a common identity between systems. This roadmap should guide all system investments, upgrades, and enhancements. This will make Kansas more attractive to businesses because there will be less cost and effort involved to start up and conduct business in Kansas.

The State should develop an identity management strategy for citizens and other individuals. The ITIMG along with broad agency representation should develop a risk and solution matrix to help guide agencies on what identity solutions are needed for agency applications. An identity management roadmap outlining a common approach for identifying individuals should be developed. This roadmap should guide all system investments, upgrades, and enhancements. This will make Kansas government easier to work with, reduce complexity of government, and provide a simple, yet secure approach to work with state and local government.

The State should not extend an identity management capability to the local government entities at this time. Kansas must first develop its own internal identity management system. However, Kansas should engage local government's business and technical professionals in the requirements gathering and design of the statewide identity management system so it could be leveraged by them at a later time.

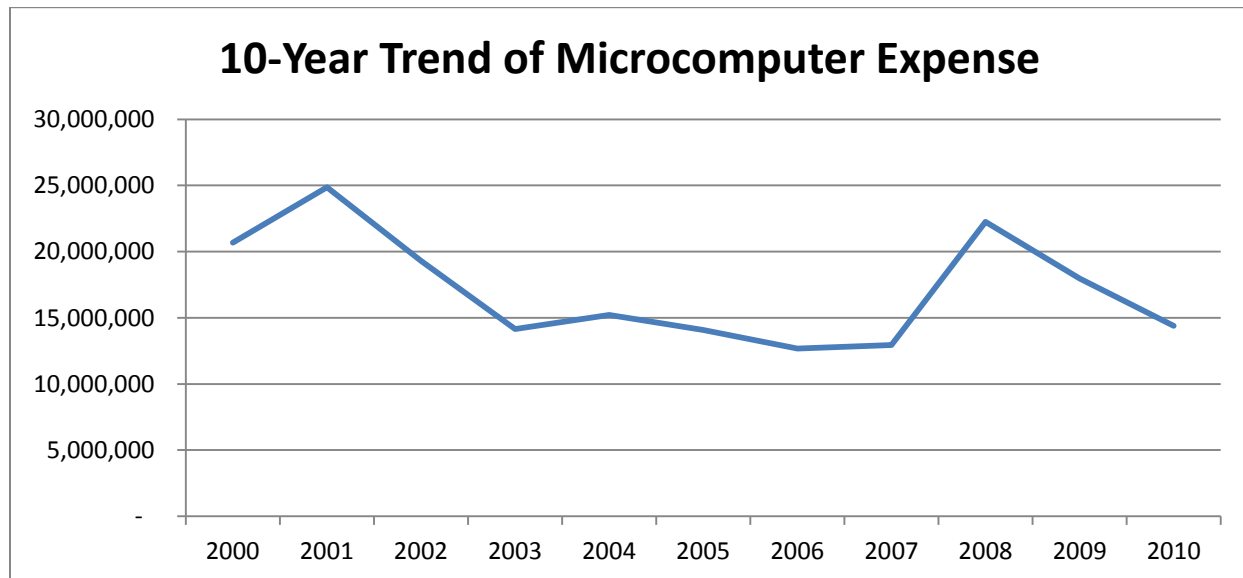
³⁶ Andrew Walls. "Q&A: Consolidation of AD Forests and Domains" [Gartner Group](#). June 17, 2010.

DESKTOP SUPPORT

Overview and Status Quo:

The State of Kansas has to support over 25,000 employees in locations all over the state³⁷. This support includes providing desktop computers, desktop productivity applications, and security and protection solutions. As the State enables more employees with the ability to work mobile, there will also be a requirement to support more devices that are mobile, provide technology to synchronize mobile and desktop devices, and provide advance networking and security practices for mobile computing.

The innovations occurring at the agency level have kept the expenses for desktop almost flat for many years.



The collection of these expenses brings the average overall support costs to \$17,139,662³⁸ over the last three years. If that cost is spread out evenly across all 25,000 state employees, the annual cost to provide IT support to a state employee is \$685/year.³⁹ The state has done an effective job of providing enterprise contracts to enable agency purchases and that has allowed some desktop deployment cost to be reduced. Some small agencies are already working under a consolidation support arrangement with DISC providing desktop support services.

Problems associated with Status Quo:

Today each major agency provides and supports its work force in isolation. Inside those agencies, best practices are being developed and innovation is occurring. However, since this innovation is occurring in isolation the benefits are also isolated to each agency. This federation leads to significant differences across agencies. Different products are being used, different support methodologies are being used,

³⁷ This number does not include Regent Institutions.

³⁸ This number does not factor in IT employee support cost.

³⁹ This is also an area where agencies are bringing in Vo-Tech and university graduates as interns and temporary staff technicians to get them real world experience. This is a great training ground to make people aware of the agencies business practices and organization structure and culture.

and different financial and procurement strategies are being used. All these differences lead to a wasteful and inefficient enterprise, even though many agencies are running very efficiently in isolation.

Solution	# products	Target
Desktop VPN	11	No clear target
SSI	9	No clear target
Desktop productivity	unclear	Microsoft Office
Encryption	15	No clear target
Authentication/SSO	10	Active Directory and LDAP
Directory Services	12	Active Directory
File Transfer	12	No clear target
Desktop Operating systems	4	Microsoft Windows XP and 7
Digital Signatures	6	VeriSign PKI
Anti-Virus & Desktop Protection	13	No clear target
Patch Management	10	Microsoft Systems Center
Workstation policy Management	7	No clear target
Spam	16	No clear target

An example of this duplication is shown in the following chart of desktop protection products⁴⁰:

Product	Agencies	Users
CA eTrust	1	250
ESET (Nod32)	1	310
Kaspersky	1	50
McAfee	7	10,000+
MS Forefront	1	350
Norton Antivirus	1	8000
Sophos	5	37,000+
Sunbelt Vipre	1	135
Symantec	7	2,000+
Trend Micro	7	1,200+

In order to support large quantities of desktop computers, a trouble ticket and problem resolution system is required. During the survey of agencies for this study, agencies identified 16 different trouble ticket systems in operation. No single solution is deployed by more than two agencies. Since these solutions normally require microcomputer server based deployments there are functionally different support systems running in every agency. This leads to no ability to share problems, solutions, and/or best practices across agencies.

Microsoft Office is the primary desktop productivity application used in Kansas. All agencies submitting surveys for this report indicated they use the Microsoft Office suite. Even though Microsoft Office is the de facto desktop productivity standard, there is no common purchasing, budgeting, or upgrade cycle happening in state agencies. Some agencies budget to upgrade every 3-5 years, forcing them to stay on old versions until budgets for upgrades are approved. Versions of Microsoft Office running currently in

⁴⁰ This chart does not include all Regent Institution information

state government include: Office XP, Office 2000, Office 2002, Office 2007, and Office 2010. The different versions have caused compatibility issues; increased support cost, and are a security vulnerability.

Kansas is not leveraging its complete buying power to achieve positive cost externalities. Each agency and branch is negotiating and purchasing common solutions separately. Rather than using the complete buying power of 25,000 users, we are negotiating on smaller packages per agency. Missouri realized significant cost savings when they started negotiating and purchasing as a state, rather than by individual agency. For example, in an interview with the CITA's office they noted an annual savings of around \$1 million on centralized procurement of antivirus software.

How each desktop is being managed and kept up to date also varies among agencies. The more mature agencies can easily distribute software updates automatically to thousands of devices daily. Other agencies need a member of the IT staff to manually install software updates on desktop computers to keep them updated. Some agencies have set policies and procedures on how they do updates, other agencies do updates randomly without a set procedure. The lack of uniformity increases the chances of malicious attacks due to security vulnerabilities. Communication on upgrades and updates are also done in many different ways. Some agencies communicate well on changes and pilot efforts, other agencies only communicate to end users during crisis events.

It is unclear how many FTE are providing in desktop support in agencies. But, it is known that there is significant overlap between those doing desktop deployment and support with those providing middleware solutions, network and security solutions. In several agencies, rather than using authorized FTE to do desktop support, agencies use temporary staff and interns. States that have consolidated desktop and mobile support have seen staffing for these areas decrease up to 50%. To achieve this reduction states had to gain a very clear understanding of support. Staff must know their responsibilities, escalations processes, and have outstanding customer service skills. Kansas has the employee skill base and the process maturity to handle this type of shift.

How agencies deal with the energy issues surrounding desktop computing is variable between agencies. Some agencies have innovative best practices being used daily. For instance, machines can be shut off at night automatically and automatically wake up in the morning to perform security updates and software installations before the user comes into the office. The energy savings that can be gained from leveraging these agency best practices across the entire 25,000 desktop computers in the state would be significant. However, most current energy savings initiatives today are user driven. Moving to a common automated solution could dramatically increase energy savings.

Consolidation Options:

The State of Kansas has several viable options to pursue in the desktop and mobile support areas.

Continue Status Quo

This options will allow the agencies to continue to be innovative in delivering solutions to each employee within their agency. This will allow the maximum flexibility for agencies to move forward.

Continuing the status quo will also allow budgeting and support to continue agency-by-agency, leading to a wider range of versions of products deployed across the enterprise. This diversification brings higher support and integration costs. It makes sharing documents, files

and processes substantially more difficult and impossible in some cases. It allows multiple versions of the same products to be used, increasing the possible security vulnerabilities. This also requires agencies to continue to justify basic desktop support and upgrades as significant budget issues.

Standardize all desktop products and support areas

Standardizing all desktop products leads to smaller set of technologies in the state, and makes deployment and support of these solutions easier. The Kansas Information Technology Architecture could publish these desktop standards and targets.

Even with standards and targets, not all agencies will comply. Standard setting will also not help with cross-agency support. Multiple trouble ticket solutions will still be used and agency technical support will continue to occur in isolation. Thus, the enterprise will still continue to relearn the same problems and resolutions multiple times in each agency.

Consolidate all purchasing at the enterprise level for all Hardware and Software

Getting visibility and oversight on all desktop purchasing activities is the only way that Kansas can continue to bring down the cost of desktop support without full desktop support consolidation. Negotiating for the entire state is the only approach that allows coordination of the desktop suite and other solutions to be considered as part of procurement process. This is also the only approach that fully engages the vendors. When agencies have the ability to opt out of preapproved contracts and do separate negotiations the faith of the negotiation is compromised. By using the statewide purchasing power, other states have seen significant cost savings in providing desktop hardware and software to its employees.

Consolidate all IT support for desktop

This option brings together a centralized and dedicated desktop support team that can support all desktop computing in Kansas government. This includes desktop deployment, software deployment, hardware and software upgrades, incident troubleshooting and resolution, and security resolution.

Coordination of the consolidated desktop support team would decrease the overall cost of IT support. While most problems can be handled through a well trained help desk and proper collaboration and support tools, hands on resolution is often necessary. A distributed support team, working in parallel with a centralized support structure would minimize this problem.

It is also recommended that if IT support is consolidated then a Desktop and Mobile Device governance team should be created to ensure that the centralized desktop support team is providing the appropriate services and is integrating effectively with other enterprise solutions and agency specific needs.

Recommendations:

The State of Kansas should consolidate all IT support into one centrally managed team. This team would be responsible for the purchasing of all hardware and software and integration of these products into other enterprise solutions and agency products. This team would be centrally managed but would require a geographically distributed support model where technicians would be distributed across the state to support all state agency locations. The field technicians would leverage a centralized help desk

and trouble ticket system to better support the enterprise. A central software distribution solution should be deployed and used for all state devices.

This central team should do the purchasing of all desktop and mobile products. It is also recommended that the state move to standard products and solutions architecture identified by the KITA and deployed to the enterprise. Missouri found that it could provide less than 20 unique configurations to support entire workforce. They initially started out with several thousand.

It is further recommended that the State of Kansas move to an FTE-based financial support model. This model would move away from agencies budgeting and purchasing individual products annually or specific budget request to support agency update cycles. DISC would provide default catalog of services with costs based per FTE. All employees need a basic computing device (desktop or mobile), productivity software, and desktop protection. Additional software and services could be subscribed to for additional cost. The overall cost of desktop support would be same or less than agencies are spending now, while also building in hardware and software refreshes. This new financial model provides stability in funding. Periodic updates can be built into the rate and be more predictable. Desktop and mobile options must be made available, and additional services could be subscribed to al-a-cart for power user needs.

To enable these recommendations access across agency networks, collaboration capabilities by the team is essential.⁴¹ Best practice software distribution, support solutions, and processes should be identified in individual agencies and those best practices should be scaled to the enterprise. Developing proper rates and complete transparency of those rates are critical. The governance team should be in charge of oversight of those rates.

The overall cost of providing desktop support to state employees should be reduced dramatically. Hardware and software will cost less to deploy and support with fewer FTE. In addition, there will be less redundant solutions and less complexity across the enterprise.

NETWORK SUPPORT

Overview and Status Quo:

The need to communicate within and between state agencies, local government, private partners, and citizens is continuing to increase. The State of Kansas approach to support that need is being handled with many different data networks. The following is a short summary of various network capabilities the State uses.

Network⁴²	Purpose	Oversight
KANWIN	Kansas Wide Area Information Network for data movement primarily between agencies but is also extended to counties.	DISC
KANSAN	Kansas Voice network	DISC
KanEd	connection to Higher Education, K-12, Libraries	KBOR

⁴¹ See Network and UCC recommendations

⁴² Note that there are several connections to the federal government and national safety and military that are not covered in this section. While these and connections to other states will increasingly become a focus, there was not sufficient time or information to formulate any recommendations in these areas.

Network ⁴²	Purpose	Oversight
KanREN	and Hospitals. Managed by KanREN K-12, Higher Education, Public Hospitals, Other non-profit, libraries.	KanREN Board
800 MHZ Radio	Public Safety, KDOT, KHP, other agencies, local government public safety.	KDOT
Fiber Backbone	State agency Data exchange	KDOT
KSOS –County Election	Election officials	KSOS
KDOR- County	County Treasures, tax, Property	KDOR
KCJIS-	Public Safety, Law, Courts, Jails	KBI
KDOT ITS	Highway Intelligent transportation Services	KDOT
911- NG911	911 services	Local managed today

Each of these networks were initiated for good reasons and based upon the best practices at the time. However, each individual network has a different management team, brings different best practices, scalability, and approaches to operational management. Each of these networks is a success story of past consolidation efforts in Kansas.

Over the years, each of these networks has undergone significant upgrades. KanWIN is upgrading currently to a new network architecture. KanED has upgrade much of its core recently. KanREN has plans to upgrade its core in the near future. Next Generation 911 (NG911) will require an expanded network capability as 911 contact centers are beginning to collect information from many sources besides telephones.

Networks demands are constantly growing. Contributors to this increase in demand are increased use of streaming video and audio, virtualization of desktops, and shared workspace collaboration. These trends could possibly increase network traffic by over 100% in the next five years.

Problems associated with Status Quo:

Kansas does not have a clear, comprehensive understanding of the networks the state is currently running. Individual network managers understand their unique networks and have some knowledge of other networks. Nevertheless, there is not one group that truly knows everything about the state networks. This includes assets, state and local network connections, licenses, ect. This leads to redundant connections and single points of failures. The Broadband Task Force has determined these issues are causing a direct impact on the state's ability to provide efficient network services to businesses and citizens. Under the status quo, Kansas does not have enough data and oversight necessary to streamline these connections and investments.

This does not mean that Kansas is lacking in expertise to provide network solutions. Each network described below has excellent staff and approaches. Some networks are even working together to provide the best service possible. For instance, KanREN supports the KanED network. Also, KanWIN, KanREN and KanED all partner with KDOT to use its fiber backbone. Finally, KanED and KanWIN peer their networks for seamless handoff of traffic. There is a spirit of collaboration and partnership between all the networks.

One major area where collaboration and partnership can be improved is in the network connections in county government facilities. These connections occur between county agencies and state agencies. For instance, Kansas Department of Revenue connects with county treasurer's offices. Secretary of

State connects with county clerks. Kansas Highway Patrol connects with local law enforcement. A substantial number of these connections are point-to-point, and require a separate connection for each agency interaction. Having redundant connections between state and local government units increases connection cost to the local government units. It also takes more staff time at both the state and local level to manage these connections. Since these connections are point-to-point between the county and the state it has eliminated the ability for counties to work together, share solutions, share data and support each other. These bifurcated networks came into existence at a time when data security in communication lines was not mature. Advances have been made in data security that makes this bifurcation unnecessary.

Almost every state agency has a virtual network within the KanWIN network, and between these virtual networks are agency run firewalls to protect those agency virtual networks. This makes sharing data between agencies difficult to accomplish. Other resources that could be leveraged between agencies (servers, storage, printers, and video conferencing systems) also cannot be easily shared. Agencies express concerns over security and a lack of trust in other agency environments as reason for these agency by agency restrictions. This concern is legitimate, but could be mitigated with the proper leadership, policy, and governance models.

There are many major initiatives occurring in Kansas today. Many of these initiatives are happening because of the American Recovery and Reinvestment Act (ARRA). These initiatives need a cohesive state-wide response by all levels of government. Included in these initiatives are NG911, Broadband expansion, health care reform, and Health Information Exchange. Currently, these initiatives are all driven by separate focus groups. Since many of these activities overlap, a concerted effort is needed to make sure the initiatives stay in alignment, so Kansas uses ARRA grant moneys in the most effective way.

Consolidation options:

Continue Status Quo

This brings greatest flexibility to each network to evolve and scale based upon its own individual demands, but also leaves all problems associated with status quo in place.

Consolidate all networks and network support and management under one

This option is impossible to accomplish today. The size of the organization needed to manage all the networks would be huge. There are different network design, business plans, governance models, and delivery mechanisms involved. Even though this option, in a perfect world, would be the most efficient there is not transition mechanism in place currently that could execute this type of consolidation.

Create Governance group to oversee all network roadmaps and accomplishments

Information Technology Executive Council (ITEC) could charter a Network Operations Governance Group to give clarity and oversight to all the state networks. This group could be asked to indentify current network assets, availability, accomplishments, and provide a consolidated and coordinated 3-10 year roadmap for each network. It is expected that if any consolidation opportunities appear that this group would be the first to see that overlap, and develop a strategy to execute those opportunities.

The status quo of multiple networks does not have that many problems, but biggest problem is that every network is its own empires, that are continuing to grow. Some partnering and coordination is happening, but more could occur. An officially chartered group would be a logical first step to engage in more partnerships. Since our customer base for these networks is wide, it is recommended that the group consists of a membership similar to ITEC and other statewide governance groups. State government, local government, education, and the private sector should all have membership in this group.

Consolidate some Networks or network support areas:

There are over 180 FTE currently classified as network technicians in Kansas government. A consolidation option is to centralized all the staff working on voice and data networking to DISC. This is an option that has been popular in other states. The typical results of a network support staff consolidation is a continuous reduction in network support costs, more consistent deploying of equipment, better support, and a more available network.

This effort would be a significant change in Kansas because for years the state has allowed agencies the option of supporting their own complete networks in their facilities. It is estimated there are 180 FTE doing network support, but the actual number is unknown due to partial FTE assignments in facilities, and incomplete data on unclassified staff. States that have undergone this consolidation have seen a reduction or reallocation of network support FTE from 10% to 50% over time.

Re-architect all connections between state and counties

Local government IT managers suggested that a re-architecting of all network connections between state and local governments would be beneficial. They identified this task would allow them to leverage their investments more wisely, reduce network support costs, enable collaboration between counties, and increase county network capabilities. The separation of logical networks by line-of-business/agency is an old model that is not appropriate any more. Re-architecting will save money by decreasing operational costs to agencies and lowering support costs. While there is not valid data to predict these savings, local government IT leaders believe there is a significant opportunity to reduce costs.

Recommendation:

Even though it is obvious there is redundancy and overlap in the existing data networks, there is not clear data that suggests they should be combined. Each network serves a specific population with specific needs. But, the State of Kansas should have a better understanding and knowledge of the networks. This includes an inventory of assets, current and planned projects, and future expansions. The Calence Network consolidation study identified various recommendations for state data networks. These recommendations included standardization, some network circuit consolidation, shared services, and common communication⁴³. Gartner contends that networking costs can be reduced by 25% if their network cost management methodology is fully implemented⁴⁴. Missouri and Nebraska did consolidate

⁴³ "State of Kansas Network Consolidation Feasibility Study" [Calence](#). March 2007.

⁴⁴ Jay Pultz. "How to Significantly Reduce Networking Costs" [Gartner Research](#). March 2, 2010.

all data networks and staffing, but with the current incomplete picture of network capabilities in Kansas moving towards data network consolidation would create more risk⁴⁵ than potential value.

The recommendations that follow are governance, staffing, and preparation work that needs to happen before further Network consolidation discussion should take place. If these recommendations are implemented, network consolidation should be revisited in three to five years.

There should be a dedicated effort to establish a state of Kansas network Governance structure. The Network Support Governance Group should:

- Provide oversight over Kanwin, KanEd, KanRen, Wireless, 800 MHZ, Fiber network, NG911 and logical networks for KCJIS, KDOR & KSOS county networks, and KDOT ITS network, broadband expansion, Health Information Exchange network.
- Be chartered under ITEC with specific responsibilities, memberships to include agency, local and private sector directors and network specialists.
- Acquire the current asset inventory, connections, backbone capabilities, past accomplishments, future roadmap, and financials.
- Focus on strategies, standards, leveraging investments and management capabilities.
- Develop common architecture and strategies on to support a mobile workforce.
- Develop reporting criteria to ITEC on a yearly basis for each network, focusing on current year activities, and the three-year future strategies.

The State of Kansas should continue to modernized it's infrastructure. This includes continuing with the KanWIN modernization project. The full implementation of KanWIN 2.0 will bring Kansas to a new level of capability needed to build the next generation of web-based, customer centric, government services. This modernization includes the "core" network infrastructure and the VOIP/UCC rollout to consolidate the voice and data networks.

To support this effort there should be a KanWIN advisory board established to provide the oversight and prioritization for all network activities The KanWIN Advisory Board should:

- Identify the strategies for KanWIN.
- Determine KanWIN financial and cost recovery model.
- Determine and monitor network performance and service level agreements.
- Determine and guide mobile workforce strategies as it relates to KANWIN
- Identify and initiate policy and guidelines around network issues and usage
- Redesign the KANWIN network to allow for more application and data sharing across agencies and the enterprise.

KanWIN should focus on consolidation of activities and resources related to its network connections. Kansas should transfer all agency network technicians to DISC. Many of these individuals will remain in the physical location they are currently but will be DISC employees rather than that agency. Along with this shift, a more sophisticated project and task management system will need to be created to support statewide network management. It is estimated this employee shift will be around 100 FTE and should

⁴⁵ Part of the complexity and risk comes from the ability of dedicated network managers to get federal grants, Kansas Universal Service funds, and research regulations. Any change in the network support model has to support this complexity.

be done incrementally over at least three years. Other states have identified 10% to 50% cost efficiencies in this area.

The benefits to the state can occur in multiple areas:

- Core network support efficiencies by a better managed workforce
- Centralization of core technology to one platform
- Consolidated purchasing of network solutions
- Reallocation and/or retraining of workforce to reduce consultant dependency
- Reduced complexity in the core network
- Reduction in internal barriers of information sharing in the enterprise
- Redesign KanWIN to support mobile workforce in more efficient approaches.

Kansas should also focus an effort to reduce or eliminate agency virtual networks. These virtual networks are causing design and traffic issues and are slowing down our ability to use modern technology, such as AVPN, and are reducing our ability to share resources between agencies. They are no longer needed for security.

Network connections with local government entities should be re-architected to use circuits more effectively. There are significant opportunities for larger counties to share, host, or support other smaller counties if the network allows it. This was articulated as a significant opportunity in the Texas consolidation plan and in conversations with Nebraska. The benefits to the state can occur in multiple areas:

- Reduction in number of circuits used to support unique line of business demands.
- Sharing of network infrastructure procurement contracts
- Reduction of long distance costs to local government
- Guide the evolution of NG911 with a common backbone
- Ability for counties to work together in a dramatically different model than exists today
- Easier to share information with other counties and the state
- Share solutions with other counties and reduce support costs
- Bring a higher level of solutions and skills to smaller counties

OTHER MIDDLEWARE APPLICATIONS

Overview and Status Quo:

As articulated in other sections of this study, individual agencies are responsible for delivering technology solutions for their agency. Included in this technology stack are middleware applications. Middleware applications are defined as: “computer software that connects software components or some people and their applications”⁴⁶. Traditionally, middleware is limited to technologies like enterprise service buss (ESB), but for the sake of this report, the definition of middleware will be extended to other enterprise technologies that are used by applications to give additional functionality to applications.

In mainframe computing, all applications were running on one operating system and all agencies using that mainframe used a common set of products. This meant one transaction engine and database.

⁴⁶ “Middleware” Wikipedia. Available at: <http://en.wikipedia.org/wiki/Middleware>. Accessed October 4, 2010.

While monolithic, mainframe computing worked well because all of the applications on the mainframe shared a common set of services. As agencies moved to distributed solutions there was a need for the same type of common services. These common services are commonly referred to as middleware.

Middleware solutions are often deployed with major IT projects and then were reused with other applications. Agencies find particular middleware solutions that fit within their agency's technical architecture. No common middleware solutions have been pursued statewide. This forces each agency to purchase, deploy, support, and maintain their own middleware solutions. When you multiply these solutions across many agencies the result is many redundant and often incompatible capabilities across the state.

Middleware solutions are continuing to grow in maturity. There now exists a class of middleware services that are scalable to an enterprise the size of Kansas. The following is a representative sample of the middleware solutions used in agencies today and the current target middleware technologies:

Middleware Technology	Number of Products	Target
Internet, Intranet, Portals	11+	IIS
Document Management, Imaging, and Scanning	11+	None
Work Flow	14	None
Business Intelligence	Multiple	None
Enterprise Service/Data Bus	0	None
Data Warehouse	8	Oracle
Business Rules		
Forms		
Electronic / Digital Signature		VeriSign
Search		
Customer Relationship Management	2	Microsoft and Siebel

Problems Associated with Status Quo:

Middleware has exploded in recent years. Each major vendor with a presence in Kansas has a suite of products that cover most of the popular middleware solutions. It is common place to see many different solutions in each of the middleware areas. For instance, a survey conducted by the CITA for the Joint Committee on Information Technology (JCIT) in 2009 found twenty different document management systems from ten different vendors running in Kansas. Each one of these document management systems were purchased separately, have their own staff to support the system, and are managed independently.

Most of the deployments of middleware occurred in large agencies to help support large IT projects. DISC could not justify developing enterprise solutions for middleware applications because it could never reach a critical mass of support to justify the startup costs and staffing. Most small and medium sized agencies could never afford these solutions.

Consolidation Options:**Continue with State quo:**

Large agencies could continue to install middleware applications to support their agency missions in a vacuum, and small agencies would be unable to afford these services. This is not a recommended option. Kansas cannot continue to support middleware applications agency by agency. It increases needless complexity in our technical architecture and puts us on an unsustainable server growth curve. Servers will proliferate in this option.

Having agency-by-agency middleware solutions also makes sharing information between agencies unnecessarily difficult. Installing middleware in isolation increases the potential of incompatibility between agencies. With cross-agency collaboration becoming more common, Kansas should be looking towards common technology solutions that enable those collaborations. It will help us serve our customers, businesses, and citizens more effectively and efficiently.

DISC hosted Middleware Applications for Small and Medium Agencies

DISC, in partnership with small and medium sized state agencies, could develop a strategy and roadmap to deploy middleware applications for state agencies that cannot afford to deploy them alone. Leveraging centralized middleware applications will increase the service agency IT professionals can provide their agencies. It brings to them best of breed solutions without having to invest the upfront costs to develop the infrastructure, since they will share the cost with other subscribing agencies.

The problem with this option is getting consensus on the hosted middleware applications. Also, not having the large agencies using the service could still make the middleware applications too expensive for small agencies to afford

DISC hosted Middleware Applications for all state Agencies

DISC could develop a strategy and roadmap to deploy middleware applications for all state agencies. This option, over time, would consolidate all middleware applications into a small, manageable number of solutions in each category.⁴⁷ Agencies would need to shift some of their middleware support staff to DISC in order to accomplish this option.

Enterprise negotiations on middleware applications would help drive the cost to deploy these solutions down. Enterprise deployment would decrease the amount of servers and staff required to maintain and administer the middleware. The end result would be a best of breed solution set for Kansas that all state agencies could use.

The cost of fully implemented middleware applications is hard to predict. Each technology area will need its own study to determine the cost, benefits, and return on investment. The cost to agencies to convert to a new middleware solution could be very costly. But when the current technologies are becoming obsolete, conversion to the new version of the same solution could be just as costly as conversion to the statewide solution.

⁴⁷ Two or three options for each middleware area would be a good target. One options limits flexibility. More than three solutions are tough to support and would not be cost effective to run.

Recommendations:

Kansas should move forward on middleware application consolidation by developing a strategy and roadmap for each middleware technology area. This will be a multi-year effort and will involve multiple independent projects.

A clear target architecture should be created by the Chief Information Technology Architect (CITA) and the Kansas Technical Architecture Review Board. Agencies should begin moving towards that target architecture. Any investment in middleware applications not leveraging the established KITA targets should be reviewed by the CITA and the branch Chief Information Technology Officers (CITO) to determine if the target middleware solution can be utilized.

DISC should be the lead agency in the deployment of middleware applications. These applications include but are not limited to: Document Management, Workflow, Enterprise Service Buses, Business Intelligence, Call Center, Customer Relationship Management, Data Warehouse, and Master Data Management, SharePoint Intranet portals.

Enterprise Service/Data Bus (ESB) is the first middleware application Kansas should develop a strategy and roadmap for. Kansas has a pent up demand to share and exchange data in real time across applications. Multiple cross-agency collaborative teams have expressed need for this type of investment, and there are currently a number of projects under consideration that are looking at ESB investment. A clear strategy is needed so multiple agency ran ESBs are not deployed in Kansas.

Customer Relationship Management (CRM), Master Data Management (MDM) and Data Warehousing (DW) look to be the next logical areas of focus for a comprehensive consolidation strategy and roadmap. They would increase our ability give a consistent and statewide view of our customers, businesses, and citizens to our employees and decision makers. In order to support an enhanced relationship, Kansas must share information between agencies.

Being able to achieve middleware consolidation will require a state of the art data network, and all security concerns to be solved or mitigated. KanWIN must finish its upgrade to the core network. Identity management for the enterprise is required to facilitate cross agency data sharing. Agency development staff will need training to learn how to best leverage the centralized middleware solutions.

AGENCY APPLICATION DEVELOPERS**Overview and Status Quo:**

The State of Kansas has excellent IT development staff. These teams of agency application developers understand the agency they work for, its business processes, data architecture, and customer expectations. As IT has evolved the skill sets of developers has evolved with it. New skills including business analysis, data management, and new tools for application customization and development are required. These skills make it possible to continually improve IT application, thus helping the organization complete its mission.

The Kansas Project Management Methodology (PMM) was created in the 1990's and has given focus, direction, consistency, and oversight over large IT projects. But, projects that do not reach this large project threshold still are managed using a wide array of approaches. No projects under this \$250,000 threshold is visible outside of the agency.

If a project are a greater effort than agencies can support internally then the outside consultants are used. This has allowed Kansas to remain current on leading each technology while keeping FTE levels for development staff stable. This consultant spend was kept manageable because at the core of our IT employee base was a critical mass of long time personnel. As those core staff members retire or change jobs Kansas has become increasingly reliant on consultants, especially in the difficult to find areas of project managers, business analysts, IT architects, and data experts.

The solutions used today are constantly changing. More state solutions are packaged products that are bought off the shelf. Configuring these off the self packages is important, but also is very expensive to develop, manage, and maintain. When upgrades to the software are provided by the vendor, often times the customized interfaces and modifications will also need to be changed.

Problems Associated with Status Quo:

Most agencies are satisfied with the solutions delivered today in the status quo. However they recognize the cost to support a larger legacy IT application base is growing and minimizing that growth would be advantageous over time. Development teams are closely aligned and understands the agency's business needs. Sometimes this alignment it to the detriment of the agency, as developers lose sight of opportunities that are available in other agencies.

The mainframe provided a single set of libraries for all source code needed to run applications. With the advent of more distributed computing the number of tools available to developers proliferated. Source code is scattered all over the place. It is quite likely that no agency really knows where all its code is today.

Because of the variety of locations and solutions that data is stored in today, it is very challenging to identify all data in an agency, and to understand how it is all related. Few agencies are working on projects for metadata management or data catalogs. This need will continue to grow as cross-agency collaboration and data sharing become more popular.

Kansas has a solid set of developer staff today, but some of the skills in emerging areas is not sufficient to support many of the complex requirements that exist in our systems. With the shortage of staff, and the loss of key personnel the State of Kansas has not kept pace with advanced skill development of our current development staff. Also, other critical areas like Project Management, Business Analyst, IT Architecture, Engineers and data experts.

Consolidation Options:

Continue Status Quo:

Continuing our current path is viable option since it is currently successful. The problem with this option arise because technology continues to evolve, but training and skill development of our development staff cannot keep up. With a limited staff, it is hard to keep up with all the different skills that are required. This problem is magnified even more in smaller agencies. They have the same complex business requirements and needs as the larger agencies, but have less staff and less budget to complete those missions. In a budget time when adding staff is almost impossible, though decisions have to be made on what development expertise is retained in each agency.

Consolidate all developers:

Consolidating all development staff into one organization has been an option taken by other states. However, most of the states that have done this have left the developers physically located close to the agency they are supporting. In these models they work for the centralized IT organization, but do development work for another agency. Business knowledge is critically important to development staff success. As a result, it is not recommended that all development staff should be consolidated. Agencies that naturally work together may find a limited developer consolidation to be advantageous, but widespread development staff consolidation is not recommended for Kansas.

Pool of Developers for Small and Medium Sized Agencies

Kansas has many small and medium sized agencies. These agencies have unique missions, but often have limited IT staff. In some cases many of these agencies perform similar tasks (licensing, permitting, and regulatory monitoring). However, each of these agencies need IT solutions to support their agency missions. They need the same level of expertise in business analytics, IT architecture, and project management as the large agencies, but these skills are difficult to fund with their limited budgets. DISC could employ a team of developers, business analysts, project managers, and IT architects to help small and medium sized agencies develop solutions. Real process analysis and solution architecture even in these small agencies will result in increase citizen and business relationship.

Consolidate all Data base professionals

This option is similar to consolidating all developers. Since data administrators needs to be close to the business needs and developers it is not feasible in most agencies to consolidate this area.

Common tools for data catalogs and metadata management

Data catalogs and meta data management is something that every agency needs to do. While a limited number of agencies are working on these areas, there is no solution or strategy available for the enterprise. A focused group of data professionals could come together and develop a strategy and roadmap for the enterprise to solve this problem. Master Data Management and data catalogs are essential tools for cross-agency data sharing and consistent security controls. It is also essential for search in intelligent applications to find the appropriate information in the context of application usage.

Recommendations:

State agencies should always maintain their own unique development staff. Regardless of consolidation strategies, it is best practice to leave developer, data owners, data administrators, and business analysts as employees of each agency. These positions require intimate knowledge of agency business processes.

However, the development model will change under IT consolidation in order to take advantage of consolidated services like enterprise service bus, document management, and workflow solutions. This changing development model will require very specific skill sets. It would be unfeasible for every agency to hire this type of specialized employee.

- Large agencies should work with DISC and bring advanced training to support these skills into our workforce. Current application development staff should be adequately trained on

advanced architecture and design skills in order to leverage the new technologies available to them in an consolidated IT environment. This will reduce the dependency on consultant or contract expertise.

- DISC, working with all branches of government, should research the demand for a centralized pool of application developers, business analysts, project managers and IT architects hosted by DISC that could be available to state agencies and in all branches of government.

DISC should support a common repository for developed source code. This should allow agency developers to develop and deploy their own solutions but they do not have to maintain the actual repository itself. Existing agency repositories should be migrated to this central repository. This along with an employee collaboration environment will enable cross agency development efforts and sharing solutions and expertise between agencies.

DISC should invest in a robust IT project and portfolio management environment. All work efforts should be identified for all levels of government. The ability to have cross agency teams scheduled and coordinated in a consolidated environment is essential to success.

While data administrators and data owners should remain in their respective agencies, it could be beneficial to support all database engines centrally. It would provide reduced licensing costs, ensure more predictable backups, increase stability, and reduce the amount of support staff required. Further research and a pilot effort, led by the CITO's, should be initiated to verify the appropriate changes in processes and job duties this type of change would require. When the new data centers are available the database engines will all be in one place and a central team to support them is feasible.

VI. NON-IT ISSUES RELATED TO IT CONSOLIDATION

While obtaining the data for this study there were a number of non-technology concerns articulated by industry experts, technology leaders from other state governments, and our own state IT leaders. These concerns and risks must be solved or mitigated before IT consolidation in Kansas could be successful.

LEADERSHIP AND GOVERNANCE

IT consolidation projects fail without proper executive leadership.

The Governor of Kansas should sign an executive order mandating IT consolidation for executive branch agencies in Kansas. The Governor's leadership role is foundational for IT consolidation success. Legislative and Judicial branches, while not explicitly mandated to participate in IT consolidation, should be active members in all phases of the IT consolidation project. There is a hope that both of those branches, at some point in time, would also use the consolidated services provided for the Executive Branch.

The role of the Executive branch Chief Information Technology Officer (CITO) should be expanded. All current responsibilities of the CITO would remain, but the role would increase to include approval authority on all Information Technology purchases by state executive branch agencies, and to provide direction and coordination of the statewide shared services outlined above. Often the CITO is a cabinet level position. Other states governments that have had success consolidating have elevated the role of the CITO to a cabinet level because the cabinet-level CITO shifts the discussion of IT towards business driven initiatives and project coordination. This shift allows Kansas to focus on project prioritization, financial shifts and to better serve our citizens and businesses. This recommendation is not a pre-requisite for IT consolidation success, but while conducting research on other states, a common trend of success followed in states that elevated the CITO to a cabinet-level position and should be strongly considered.

Approval on all IT purchases give the State CITO the ability to shape the technical architecture of the state. The State CIO in this capacity would work closely with the Chief Information Technology Architect to ensure compliance with the Kansas Information Technology Architecture (KITA), and would lessen the chance that duplicative technology solutions are deployed in the state. Currently, the branch CITO's only have approval power on IT projects that are over \$250,000. This threshold must be lowered to give the State CIO a complete view into all IT purchases. In addition, Legislative and Judicial branch CITO's should also have similar approval authority for their respective branches. Another pre-requisite for success is for the KITA to continue its evolution to becoming a target-based architecture. Without targets, the CIO's purchasing approval does not have proper criteria to base a decision on. The next revision of the KITA should have targets assigned for all technology areas as outlined in the 2009 Strategic Information Management Plan.

The CITO should also provide direction, project identification, and coordination on all statewide-shared services. This duty would include responsibility for requirements gathering, solution design, coordinating funding and budgets, prioritization of enterprise projects, and marketing the solutions. Also, the CITO should find solutions that leverage the best practices and innovation that is occurring in state agencies. Existing solutions that can be scaled to the enterprise level, and meet the needs of the customers should always be preferred over entirely new solutions. The benefit to this direction and coordination are having a clear roadmap and enterprise prioritization, ability to share investments

across the entire state, reduce redundancy and needless complexity, and expand the number critical services and solutions that are available to every state agency.

IT consolidation will require adequate levels of resources to achieve maximum success. As outlined in the Strategies and Recommendations, new modernized data center space will be necessary to complete all of IT consolidation recommendations. Other upfront costs will also exist, but will not be nearly as great as the investment in new data center space. There will also be an IT staffing rearrangement under IT consolidation. Agencies will no longer need many of the IT support staff they currently are authorized, but DISC will require more employees to provide new and expanded services to all state agencies. The Governor and Legislature must adequately support and fund DISC in order for them to succeed in this new, expanded role. This support will require budgeted money. Two new data centers will need to be invested in. The cost for these two new data centers will be an estimated \$58 to \$95 million. DISC will need more employees to support the increased role of enterprise IT service provider. Some agency IT staff will need to be shifted to DISC, and other specialized staff will need to be hired. This support will also require policy and statute changes as outlined above.

Branch CITO's must serve as an advocate for IT consolidation and do everything in their power to gain support, buy-in, and participation from their constituents. State agency heads and IT leaders must work in partnership with DISC to develop services that meet agency business needs, and to help with the transition of employees from specific agencies to DISC.

Finally, while the Legislative and Judicial branches of government would not be affected by a Governor's IT consolidation executive order, their participation in IT consolidation strategies should be encouraged. The Legislative and Judicial branches both serve, in many regards, as DISC does for the Executive branch. They are a shared service provider to their respective branch of government. There would be great benefit to their branches to participate in the IT consolidation strategies outlined in this report. Leveraging the DISC shared services, when appropriate, would decrease Legislative and Judicial branches' cost to provide IT services and would remove the burden of supporting these services, thus allowing for more time spent on line-of-business specific tasks. Due to the possible benefits to be gained, the Legislative and Judicial branches should be encouraged to participate in all discussions, requirement gatherings, and the design of all DISC shared services with the understanding that their use of these services is desired and recommended.

Having strong executive leadership is critical for IT consolidation. States without Governor support failed more often than they succeeded. States without an empowered CIO had a difficult time gaining the active participation of state agencies. States without a robust and target-based technical architecture did not successfully consolidate solutions. States that attempted to consolidate without proper funding and facilities did not gain the full benefits of IT consolidation. Governor support, CIO empowerment, target-based architecture maturity, and adequate resources are all key leadership and governance components to IT consolidation and should be considered paramount issues to address.

DISC'S ABILITY TO EXECUTE

Under these IT consolidation strategies, the Division of Information Systems and Communications (DISC) would retain and expand the role of the central IT agency for Kansas. DISC would be the agency to provide the shared services outlined in the Strategies and Recommendations section of this report. DISC would manage the new data centers, provide the server virtualization service, manage the statewide email system, along with all the other recommendations. This would greatly expand DISC's role in

providing IT services in Kansas. As a result, IT consolidation's success will be predicated on DISC's success.

Historically, DISC has proven itself a leader in providing state IT services, and has a successful record of accomplishment with previous IT consolidation projects. DISC was created in 1972 with the consolidation of Highway Department, Revenue, and Accounts and Reports data centers. DISC was then authorized to provide centralized telephone support in 1974. In 1984, DISC and the Office of Telecommunications were consolidated creating what is the current day DISC. In 1990, the statewide financial system (STARS) was implemented for all agencies to use. The statewide human resource system (SHaRP) followed in 1995.

Today DISC provides many consolidated services to state agencies. Those include state-wide data and phone network administration, computer services (Mainframe, UNIX, and Windows environments), a centralized backup management system, virtualized servers and storage, data center administration, enterprise application support, IT governance support, security infrastructure and administration, and small agency IT support.

The recommendations proposed in this report ask for a dramatic change to the way Kansas provides IT service to agencies. Whenever a dramatic change is proposed, there is always a natural fear for the unknown. Agencies are concerned the quality of received services will diminish when they are provided through a consolidated model and that direct loss of control of resources will make services less responsive to agency business needs. Employees become fearful that their jobs will be dramatically changed, downgraded, or even eliminated. Business leaders worry that their needs will not be dealt with in the same responsive fashion when IT is provided by another agency. IT consolidation has not been successful in every state. The horrors of unreliability, increased costs, and decreased performance have become reality in many state governments. However, there are many states that have positive and successful stories of IT consolidation. A common theme for successful IT consolidation in state government is a responsive, effective, and adequately funded central IT organization that has the trust of its customers.

To address these concerns, DISC must work hard to maintain and build the confidence of other state agencies. DISC must foster a culture of collaboration and facilitation with state agencies rather than a culture of dictation. Some agencies perceive that DISC develops solutions and services in isolation, instead of actively engaging users of the solution in the design and development. Mandated IT consolidation efforts will make collaboration with agencies more important. Agencies will be required to use the statewide service DISC is providing, so agency participation in the requirements of the solution is critical. The state agencies are unique and all have different requirements. Incorporating all those unique characteristics into statewide shared services is absolutely necessary.

DISC must renew its focus on outstanding customer service, communication, and complete transparency. Consolidated services rely on customer trust and a responsive customer service culture. They focus on shared services – rather than centralized services – to achieve this level of trust and responsiveness. DISC should proactively monitor its customer satisfaction and service performance. These responses should be open and available to customers. They should continue to emphasize the importance of communication by training employees on customer service and communication.

Finally, DISC must have the resources needed to deliver high quality, reliable services under a consolidated model. For example, expecting DISC to operate a much larger equipment base in the existing physical facilities with their constrained environmental attributes will place the entire state at

significant risk. In addition, expecting DISC to take responsibility for the increased tasks inherent in a consolidated model without a significant staffing increase will only result in the worst agency fears being realized.

SECURITY

During the facilitated discussions with state IT leaders one of the major trends in those conversations was the issue of security. State IT leaders worry that in a consolidated environment, unique agency security requirements will be ignored. Ignoring these requirements would not only put agency data at risk, it could also have ripple effects with federal grant dollars. For instance, the Kansas Bureau of Investigation has very strict requirements on how they handle data. These requirements are driven by the Federal Government and must be adhered to. Other agencies such as the Kansas Lottery, KPERS, Department of Revenue, and Department of Health and Environment have federal mandates on how their data and computer equipment is secured.

Other States have also found this to be one of the challenging points of consolidation strategies. They note specifically that law enforcement agencies have the most challenging requirements, but those requirements can be met. The State of Indiana said that law enforcement agencies should not be pressured to be the first agencies to move into the consolidated environments as they do have many complex requirements, but those requirements should also be considered and planned for. It is possible to consolidate law enforcement agencies, but to focus on other agencies first.

Every state that was interviewed for this study said that the security challenges posed by IT consolidation can be solved by a combination of trust, policy changes, leadership, and governance.

ORGANIZATIONAL CHANGES

The State of Kansas needs several preparatory activities in order to understand and manage the proposed consolidation efforts outlined in this study. These activities deal with enhancing the tools, processes, and skills DISC and agencies will leverage to provision, manage, and administrate consolidated IT services. Each effort may be a rather sizable project, but they will be necessary to get the State of Kansas a level of maturity it needs to succeed in IT consolidation. To help support the business cases for these projects DISC will need some additional tools and capabilities. These tools and capabilities include:

TOOLS

Asset Management

Service Catalog

Enterprise Project and Portfolio Management

Virtual Server and Storage Menu and Streamlined Billing

Business Intelligence and Performance Dashboards

End-to-End Support Tools

PROCESSES

Procurement Management Processes

Advance Planning Processes

Transparency Processes

SKILL DEVELOPMENT⁴⁸

Enterprise, Application, Solution, Data and Infrastructure Architects**Business Processes, Reengineering, and Optimization****Facilitations, Customer Service, Communication, Negotiation****Business Intelligence, Data Modeling, Performance Management, Financial modeling****Organizational Change Management, ITIL Service Management**

DISC should be the central coordinator for the deployment of these tools, processes, and skills. Also, it should develop consistent training programs to support the evolution in each consolidation effort.

DISC and the state agencies must participate and engage in conversations for each consolidation effort and identify the combination of best practices that should be used by the State of Kansas. It is recommended that a disinterested third party lead these discussions. It is normal human nature to assume the way things are done currently are the best practice. There are some cutting edge activities, that are closely aligned with industry best practices, in many of the agencies. This provides a solid foundation for successful IT consolidation.

DISC's organization will change dramatically in size and scope of activities. It is believed that in order to absorb this dramatic change in size and complexity that serious reorganization will need to occur to make DISC the most effective and efficient. The reorganization will be a multi-year multi-step process, but will be critical for IT consolidation success.

BUY-IN

IT Consolidation is not universally popular notion across state agencies. For the reasons outlined above, there is considerable trepidation amongst state agency personnel. The status quo gives them the flexibility to solve their own problems in the way that makes sense for their individual agencies. When looked at in isolation their position is correct, but at the same time this flexibility leads to redundant, siloed and incompatible solutions. This duplicated effort is not the most efficient usage of personnel or resources. Governing Magazine points out that the human component is a critical, yet often unspoken, factor in IT Consolidation success:

The spate of announcements concerning consolidation have focused relentlessly on numbers: cost savings, reductions in physical space and energy consumption, and roll-ups of e-mail systems, indicating a substantial shrinkage of what was once a bewildering array of IT systems. Left unsaid, for the most part, is the human factor: How will consolidation impact the IT workers and agency CIOs, many of whom have been working in government for decades? And how will they respond to the vast re-engineering of their jobs? At one time, these professionals provided the e-mail, networking and data services that each agency needed. Now they must think of themselves as customers of these newly centralized services.⁴⁹

⁴⁸ Note these skills are in existence in some agencies but as an enterprise consideration needs to be given to raise the level in some areas to support the consolidated infrastructure at this scale.

⁴⁹ "Merging IT Systems Causes Problems for States and Localities" Governing Magazine, September 2010.

The human factors associated to IT consolidation must be accounted for if there is any hope for successful consolidation. Past state consolidation efforts outline the following possible human related issues:

- Agency belief that their unique situation exempts them from IT consolidation
- Change resistant CIO's and IT staff slowing down and/or attempting to sabotage consolidation activities
- Small agencies beliefs that their needs will be overshadowed by larger agencies
- Agency fear that service levels will decrease and their cost to provide IT will increase
- Agency IT employee fear of job uncertainty in consolidated environment

All of these issues can be solved with proper mitigation strategies. These strategies revolve around an empowered State CIO, an effective and responsive central IT organization, a focus on customer service and communication, and preparing state IT employees for their new roles and giving them adequate training.

V. IT CONSOLIDATION BENIFITS

If the IT consolidation strategies and recommendations are implemented successfully the benefits for Kansas will include:

IMPROVED GOVERNMENT AND EMPLOYEE PRODUCTIVITY

The State of Kansas has an exceptional employee base. Efforts to consolidate and streamline IT will enable employees to be more productive.

State agencies have tremendous expertise in all technical areas that could be leveraged to create leading class technical support structures for all the consolidation options outlined above. Instead of having redundant agency IT teams all performing the same duties, there could be one single team maintaining the consolidated solutions.

With a single way to identify all state employees, data sharing between agencies will be more common. The authorization process will be simple with common employee identification that can be completed quickly. Data sharing will no longer be a significant effort, which often requires system modification and long amounts of time. This will allow employees to leverage information across multiple agencies leading to better decision-making capabilities. With an ever-increasing number of cross-agency support groups being created⁵⁰ having state information available for use across these groups will make Kansas government more efficient. Included in this common identity system, a common email solution for all state employees will be more cost effective and easier to support and administer than the 20 uniquely hosted email solutions that exist today.

The Unified Communication and Collaboration project will enable our leading class employees to serve our citizens more efficiently. Cross-agency collaboration will be simple and easy. Employees from different agencies will be able to share a common workspace and collaborate seamlessly on projects. Project sites can be created so project managers can make available their project details, documents, efforts, and tasks to all participating agencies. A State of Kansas Intranet will allow state agencies to share solutions with all other agencies. Agency staff will have access to information appropriate to their job functions without having to replicate that information in each agency.

All state employees need basic capabilities in order to achieve maximum efficiency. This basic capability is needed regardless of agency size. Enterprise solutions should be put into place to allow common computing capabilities to be used by all state employees. Common computing solutions for all employees would enable a highly efficient workforce with better tools, and better access to needed information. These solutions could open up the possibility for mobile or remote computing when the demands of the job require it. Agencies would not have to attempt to solve these issues in isolation. They would be available for the enterprise, ceasing to allow an agency technology gap to exist.

Successful IT consolidation projects involving email, identity, data sharing, and unified communications and collaboration have the ability to revolutionize the way state employees perform their jobs. They will have modernized tools and capabilities allowing them to perform their jobs better, more accurately, and more effectively.

⁵⁰ Example of cross-agency support groups: Kansas Criminal Justice Information System, Kansas Reentry Commission, Kansas Business Center, PK-30 effort, ect

While the above efforts will enable all workers to become more efficient, additional investments in the state workforce will allow for continuous efficiencies to occur and reduce our dependence on consultants. The IT employees of Kansas should be trained in IT architecture, system design, requirement gathering, and data administration. Additionally, all managers should be trained in business process and performance management. There is demand for this type of training. Over 300 state employees have completed an introductory training on business processes or data modeling developed and provided by the Chief Information Technology Architect over the past year. Training programs, like the ones mentioned above, will give state employees the necessary skills needed help transform government by improving how the state does business at the same time increasing citizen satisfaction and reducing risk.

IMPROVED GOVERNMENT INTERACTION WITH BUSINESSES AND CITIZENS

Kansas is underutilizing its ability to support the businesses and individuals in Kansas. Agencies develop their own unique ways to communicate, regulate, license, and support their customers. The Kansas Business Center helps reduce this federation by having a common website that business owners can use to find information and documentation. But having a common website for business interaction is only a beginning step. Businesses and individuals want to be able to go to one place to fill out their information, check on their status, and receive updates. They want to fill out their information once, and have it be used by every agency in Kansas. In order to achieve this vision, agency business processes need to be integrated and information needs to be shared across agencies.

IT consolidation projects can occur to help with this transition. Currently there is no easy way to share data across agencies. With a common identity solution and a modern enterprise service/data bus, it will be easier for cross-agency communication and data sharing. Having these foundational components in place will allow for the next generation of business applications to be developed to utilize this enhanced functionality.

Individuals working with state government also have many of the same needs as businesses. They want to be able to work with the State of Kansas, not one hundred unique agencies. Also, they want to have a place they can find all state services they are eligible to receive, enroll in those services, and get updates and status on their services.

Not having a common enterprise eligibility and enrollment service limits Kansas' ability to propose the correct services to our citizens. This can be done better. It will take considerable effort and will not be easy. The same technology needed for enhanced business interaction can be used and a building block for better citizen interaction. Agency leaders will need to work together and make the necessary changes to see this to fruition.

IMPROVED INFORMATION ACCESS AND DECISION MAKING

The State of Kansas has outstanding information available to its workforce. However in almost all cases this information access is limited to a small set of agency workers. Most government line of business areas⁵¹ have specifically identified data and content across many different agencies. If this data was

⁵¹ Examples include public safety, human services, education, and economic development.

assembled properly and easily available to the broader workforce there would be quicker and more reliable decisions made, since the decisions are being made with real-time data.

Better access to information, more consistent views of information, uniform tools to access information, and standardized tools to deliver performance reports can all be enabled with IT consolidation strategies around storage, data sharing, identity management, and common security models.

The benefits of improved information access and decision making by the state work force can be realized with all state servers and data being in common locations, with centralized administration and oversight. Agencies will still be able to administer the data, assign data access roles, and security profiles, but the centralization can allow for standardization on data catalogs and formats. Information will be more available and easier to share and access. The current state-wide Geographical Information System data sharing project coordinated by the DASC in Lawrence is the best example of how to accomplish statewide data sharing.

IT consolidation strategies will allow for Kansas to modernize the way data is used and consumed in the state. Data as a Service, master data management, and data exchange standards can all be developed in this consolidated environment.

Data access and sharing has traditionally been within agency's application development domain, but there are certain sets of data and capability that must be expanded to the enterprise. The spectrums of maturity between agencies is wide and varied. Some agencies have significant accomplishments with data collection and sharing, and others are lacking the skills and maturity. Using common tools for business reporting and data access can help solve this maturity gap. Kansas has great best practices occurring in state agencies that should be expanded and scaled statewide. Mandating use of industry standard data standards and information exchange models, such as the National Information Exchange Model, in all new IT projects will help make the information more available and accessible to all users of the data.

MODERNIZED TECHNOLOGY AND SUPPORT INFRASTRUCTURE

The investments in IT solutions that have occurred over the last several decades are mostly still in use today. These "legacy" infrastructures require specialized knowledge, tools, and vendor support. We constantly add on and expand these legacy systems without removing or modifying the old portions of the system. Imagine this practice occurring in building architecture, where a building that once started as a wood shack is now a towering skyscraper, yet the wood shack foundation is still the cornerstone of the structure. Many of the IT systems in Kansas are modern day skyscrapers, but have the foundation of a wood shack. This load of legacy solutions increases our risk, makes it more costly to support, and more difficult to recover and maintain. Many systems today are supported by the last person who knows how to run the system. When that person leaves, the agency will be in a crisis.

With the maturity of the KITA and the agency architects, Kansas has the opportunity to design and implement solutions statewide. The commitment to an enterprise set of architecture options can be achieved if agencies cannot "opt out" for convenience sake. Kansas IT Architecture can deliver a solid set of solutions that agencies can use to design, build and/or buy for that would be a dramatic decrease in the cost and complexity associated with the current set product interdependencies.

This will still allow for agency choices. There would be two or three common approaches for server hosting, data and content storage, storage and common ways to move and share data that will drive

down the cost to develop and deploy systems significantly. When this common solution architecture is hosted in the two proposed data centers Kansas will deliver increased stability, reduced risk, reduced cost of systems, and a more effective IT support staff. It will also allow the IT community to leverage skills learned in one agency when they move to other agencies.

These solutions, in most cases, already exist in one or more agencies. These solutions can scale up for enterprise use with IT consolidation. Other technologies can be twilighted at end of life, and the statewide system can be used.

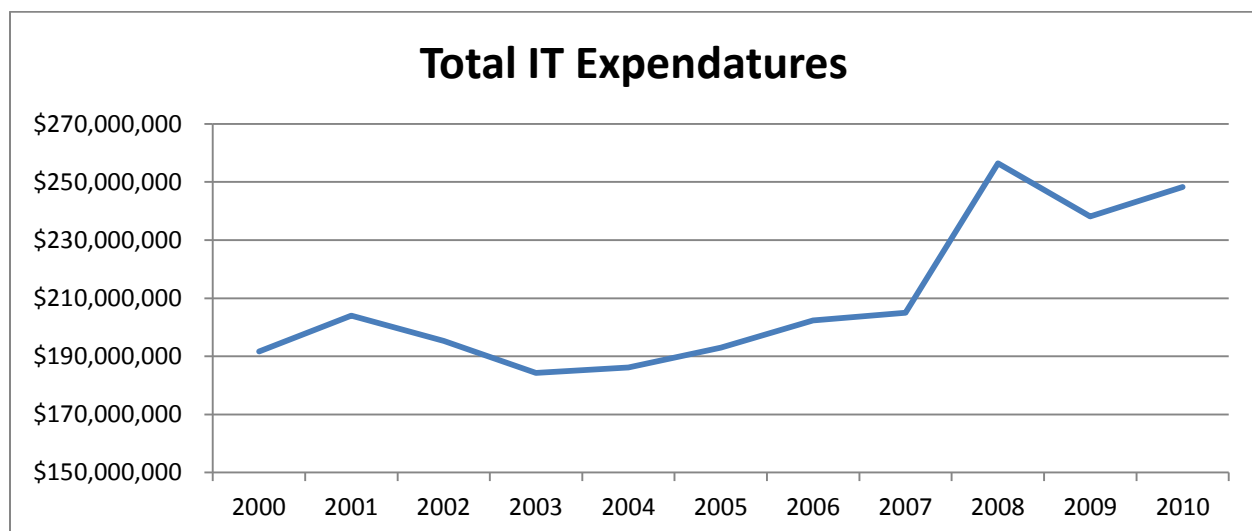
This modernized infrastructure will bring several benefits in the area of reduced energy costs, decreased carbon footprint for IT data centers, ability to support agency continuity of operation plans, and ability to recover from disaster.

In order to move towards a modernized technology and support infrastructure several activities need to occur:

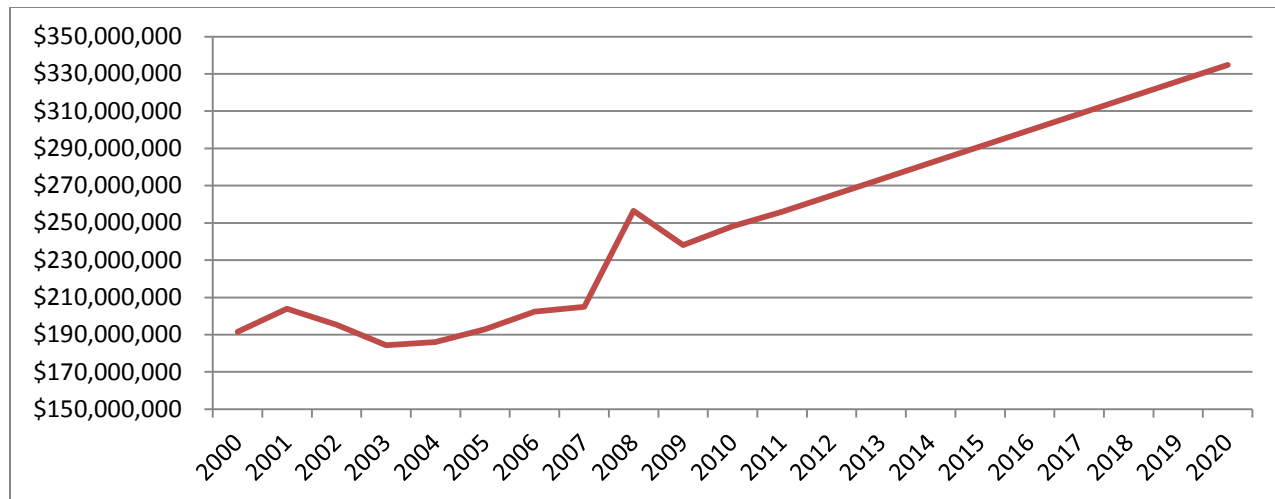
- Bring visibility to the State CIO on all IT purchases and work efforts.
- Develop Kansas Information Technology Architecture (KITA) targets for all new system development.
- Develop KITA-based deployment models for standardized IT procurement and RFP development.
- Determine what technologies and systems to twilight, retire, and/or convert

REDUCED COST OF IT OPERATIONS WITH MORE FUNCTIONALITY

The cost of information technology in Kansas has grown at roughly 3% a year for the last ten years. Efforts to streamline procurement and contracting, instituting IT governance and project management, and ad hoc agency collaboration have helped maintain this modest growth. The following chart shows the slow growth of IT expenditures in Kansas:

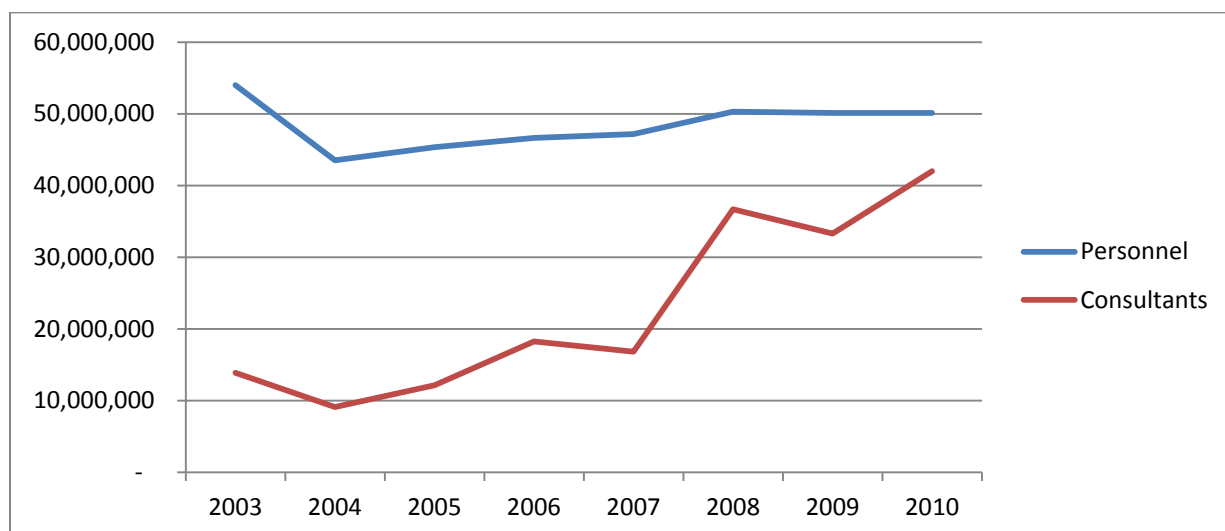


If left unchecked, the IT expenditures in Kansas will dramatically increase. In 2002 Kansas spent \$192 million on IT. In 2010 Kansas spent \$248 million. If the current trend of 3% growth remains stable, in 2020 Kansas will spend \$335 million.



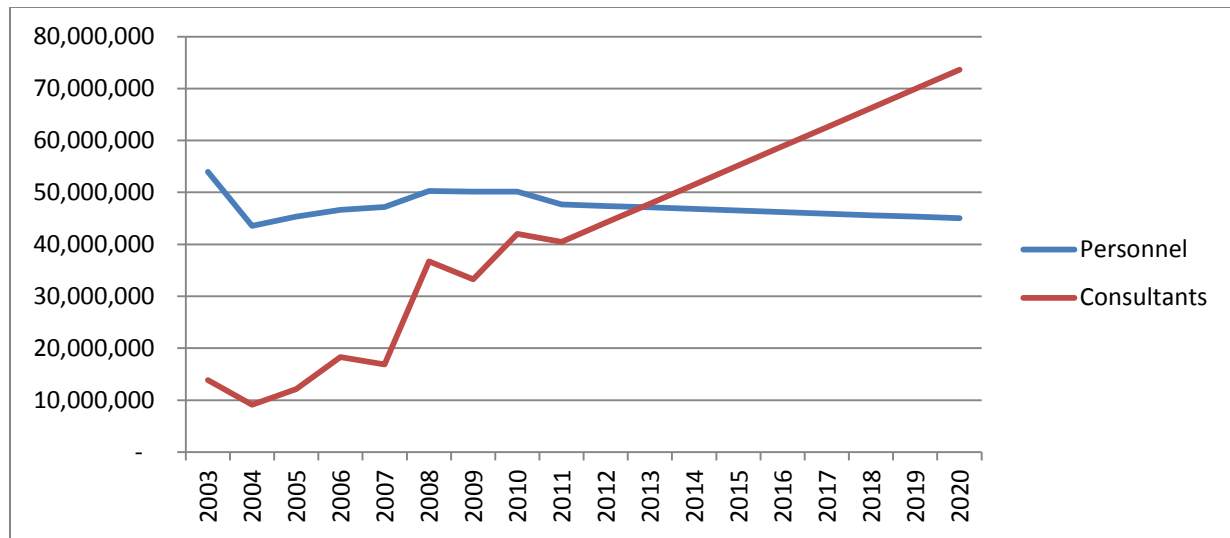
But the total IT expenditures only shows a part of the cost equation of IT in Kansas. The two major, and related, trends have occurred in the last eight years that have accounted for this increase in IT expenditures: The rapid growth of consultant expenses and the growth of host systems.

Expenditures on IT employees have remained flat, while expenditures on consultants have increased dramatically. In the past eight-years, classified IT employee expense has decreased from \$55 million in 2002 to \$50 million in 2010. In the same timeframe, IT consulting expenditures have increased from \$16 million in 2002 to \$42 million in 2010. The following chart illustrates this trend:



As personnel costs were held relatively constant during the last eight years, there was a dramatic increase in consultant expenses. This trend is not unlike the consolidation that happened in the Federal government⁵². Demand for IT services will only increase over the next ten years. More government services will be available on the Internet, as our citizens demand government access and transparency of government online. Assuming this cost trend continues in a linear fashion, the IT expenses for IT personnel and consultants will look like this:

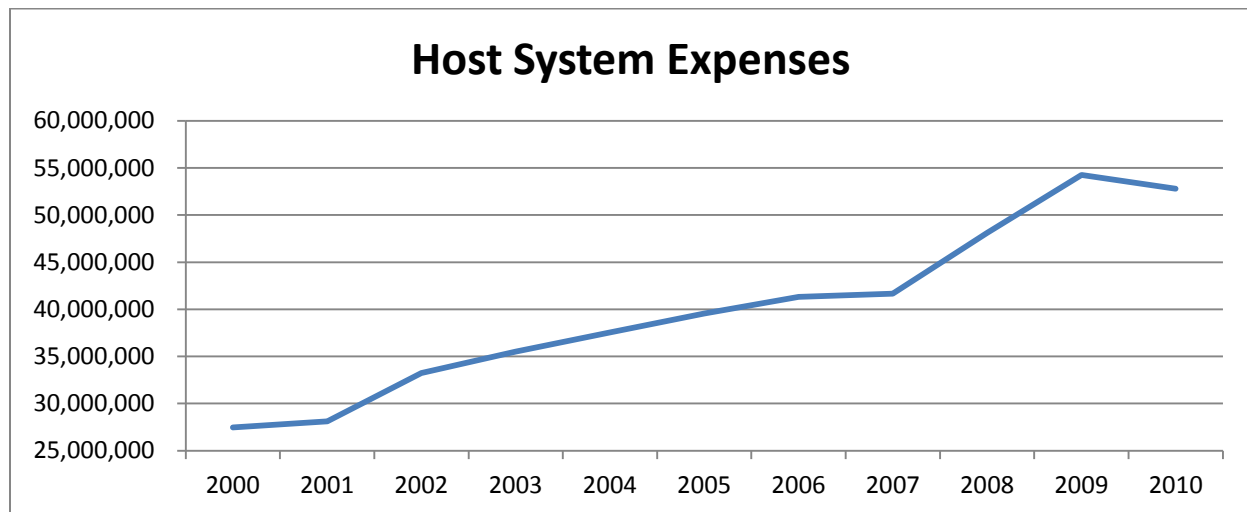
⁵² "IT Key Metrics Data 2010: Key Industry Measures: Government Analysis: Current Year" [Gartner Research](#). 2010.



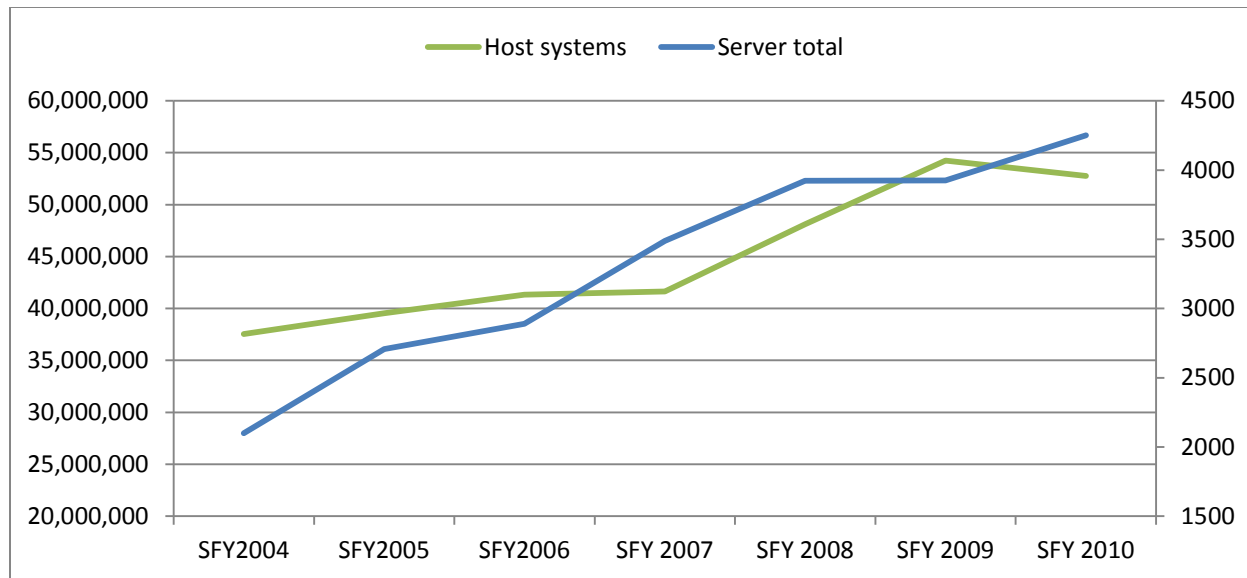
One of the important goals of IT consolidation strategies will be to minimize this consultant growth. The following IT consolidation strategies could help stabilize this growth curve:

- Decrease the unneeded complexity that exists currently. IT consolidation will decrease the number of products that exist in the application portfolio in Kansas. This will decrease the cost of support, and the cost installation.
- Middleware solutions will be deployed centrally rather than multiple times across agencies.
- Training state IT staff appropriately and adequately

The second trend in IT expenditures in the last eight years is the growth of host systems. Host systems are defined as “any networked computer that provides services to other systems or users.” As explained earlier, the last decade has seen a transition away from mainframe computing and towards using server based computing. In those eight years host system expenditures have increased by \$19 million as expressed in the following graph:



This increase in expense over time is directly proportionate to the escalation of servers in Kansas. If you compare the rate of server expansion to host system expenses, you get the following results:



The demand for IT and thus the demand for more computing power is expected to continue to grow. It is also expected that the cost of maintaining those host systems will continue to grow at the same level. Many of the IT Consolidation strategies outlined above could help stabilize the cost of host systems:

- Server virtualization can decrease the hardware cost associated with provisioning new servers
- Data center consolidation has the potential to decrease the cost associated with hosting servers in redundant facilities
- Consolidated and shared applications (identity, email, other middleware applications) and services can reduce the number of servers because duplicated environments are eliminated

Over the past ten years, Kansas has seen a modest annual increase in IT expenses. Those increases come from an increase in money spent on consultants and host systems. If left unchecked, it is projected the state's IT budget could grow to \$335 million by 2020. That would be an \$86 million growth from 2010. The IT consolidation strategies outlined in this report, if completed successfully can lead to a stabilization of IT expenditure growth while at the same time provide more and better services to state employees, citizens, and businesses.

Other states' consolidation projects have proven that it is possible to hold IT costs steady while actively pursuing consolidation activities. In order to achieve this goal, a few critical components must be in place:

Strong executive support: Usually through an executive order, the governor must give authority to IT leadership to lead a consolidation effort and give a mandate to state agencies to engage and participate in the consolidation project. Having the ability for agencies to opt-out of consolidation increases the likelihood for failure. In many cases, most – if not all – agencies need to participate in order to achieve the economies of scale that makes IT consolidation attractive financially.

Cabinet level CIO: The IT consolidation executive order must also elevate the role of the state CIO to a cabinet level position. In this new role, the CIO needs to have approval over all IT expenditures in state government and give direction for shared services. States have various thresholds for this approval level ranging from any expense to upwards of \$100,000. In the

states with the most success the threshold for approval was low and gave the CIO the necessary power to force consolidation.

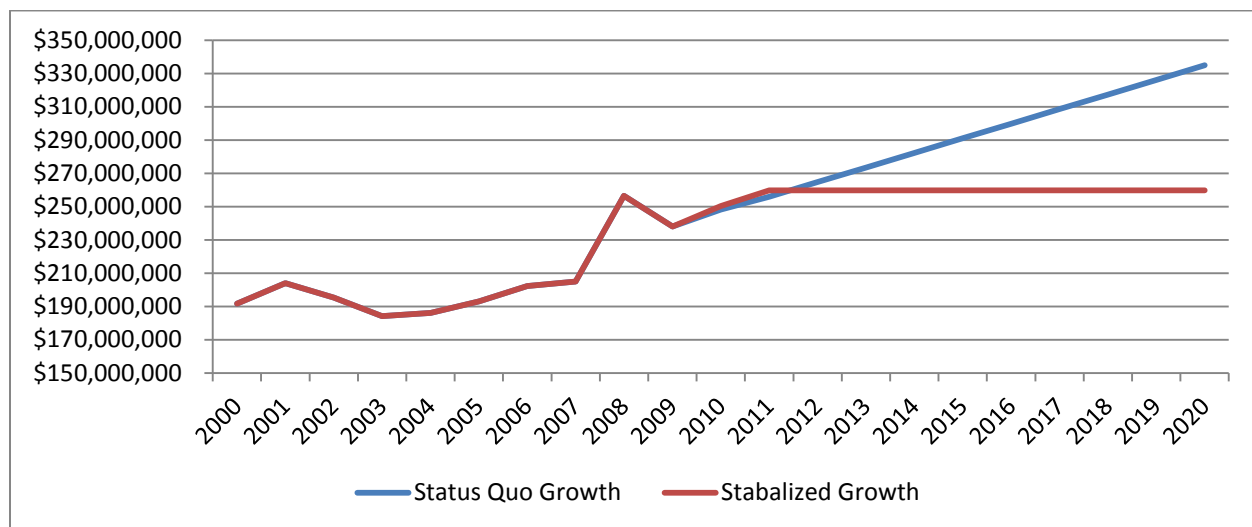
Adequate data center facilities: Without proper data center facilities IT consolidation projects can only go so far. The State will need to fund investment into two new data centers that can adequately host all state computer equipment. Upfront investment in data centers is necessary to achieve the most long-term cost savings.

Other states have proven that if these prerequisites are met there can be a substantial cost savings in a consolidated IT environment. Moving towards consolidation should, at very least, be able to stabilize the IT expenditures at its current levels. To hold IT expenses constant with consolidation, it would only require 3% annual efficiency gains from IT consolidation projects. This rate of increased efficiency is realistic when considering Indiana's consolidation has achieved almost double that return annually since 2005.

To examine the potential savings over time if IT consolidation achieved budget stabilization the following two scenarios were ran.

- Current trend of IT expenditures levels were forecasted for the next 10 years at the past 10-year growth rate of 3%.
- Stabilized IT expenditures at FY2010 levels with an additional 10 million dollar annual appropriation included to fund acquiring two new data centers as outlined in Section II.

The following charts illustrate this forecasting:



Year	Status Quo Growth	Stabilized Growth	Yearly Savings	Cumulative Savings
2010	\$248,263,436	250,266,816		
2011	\$255,933,944	259,701,000	-\$3,767,056	(3,767,056)
2012	\$264,702,897	259,701,000	\$5,001,897	1,234,840
2013	\$273,471,850	259,701,000	\$13,770,850	15,005,690
2014	\$282,240,803	259,701,000	\$22,539,803	37,545,493
2015	\$291,009,756	259,701,000	\$31,308,756	68,854,249
2016	\$299,778,709	259,701,000	\$40,077,709	108,931,958

Year	Status Quo Growth	Stabilized Growth	Yearly Savings	Cumulative Savings
2017	\$308,547,662	259,701,000	\$48,846,662	157,778,620
2018	\$317,316,615	259,701,000	\$57,615,615	215,394,235
2019	\$326,085,568	259,701,000	\$66,384,568	281,778,803
2020	\$334,854,521	259,701,000	\$75,153,521	356,932,324

If the State of Kansas takes the necessary steps to make IT consolidation successful it could conservatively avoid spending \$357 million dollars in the next 10 years. Achieving this savings can only occur with strong leadership, large-scale acceptance, and proper facilities.

VI. CONCLUSION

Now is the right time for the State of Kansas to pursue IT consolidation. The National Association of State Chief Information Officers (NASCIO) contends that 62% of the states are pursuing some type of IT consolidation. Since other states have begun consolidating IT before Kansas, we can learn from both the successful and not as successful states when developing their IT consolidation. For example:

- Missouri began consolidation in 2006 by creating a state CIO in charge of all IT in the state.
- Nebraska began consolidation in 2007 with a Governor's mandate to centralize email and identity. 18 months later the state is running on one email platform. Due to the success of that consolidation, Nebraska embarked on a more comprehensive plan to consolidate IT.
- Indiana began consolidation in 2005 with a focusing on creating a top-notch central IT organization demanding outstanding customer service and support. As a result, it has saved over \$15 million dollars annually, and continues to drive down the cost to provide IT to its agencies.

While Missouri, Nebraska and Indiana can be looked at as states that have successfully consolidated IT, many states have not been as successful as they had wanted:

- Texas outsourced their entire IT infrastructure. Cost savings associated with this strategy have not come to fruition.
- Virginia also outsourced their entire IT infrastructure. Cost savings are currently unknown, but they have learned that managing an outsourced IT infrastructure requires management skills and an organizational culture that is dramatically different than required in normal IT operations.
- Colorado has made many positive steps, but have fallen short on the savings they projected in their initial consolidation plans.

California is in the beginning stages of IT consolidation and is focused on the same recommendations this study outlines: data centers, server virtualization, and email.

IT Consolidation is not new in Kansas. This state has a long and successful history of IT consolidation. It began in the 1970's with the KAN-SAN telephone system, it continued in the 1980's with mainframe consolidation, and in the 1990's and 2000's with limited data center consolidation, and centralized Human Resource and Accounting systems. Executing the recommendations of this study can help write another successful chapter of IT consolidation in Kansas.

IT consolidation is also occurring in the other branches of Kansas government. The Judicial branch's Full Court application consolidation and the Legislative Branch's KLISS application consolidation are successful consolidation activities. Both applications reduced the number of siloed applications and put into place a complete and robust system that is driving the judicial and legislative activities in Kansas. The benefits of these consolidations include reduced cost by sharing IT infrastructure staff, services, software, and data center space.

Kansas should begin its next major IT consolidation project by moving towards a common electronic mail and identity solution. As other states have proven before, this project is relatively simple to execute and sets the stage for future consolidation projects. A common statewide email solution achieves significant cost savings, reduces needless technology complexity, and makes communication and collaboration with state government easier.

At the same time, two new state-of-the-art data centers should be invested in. When the data center facilities are running, the state should aggressively move all computer equipment to these locations using virtualized servers and shared storage whenever possible. With this centralized infrastructure in place more aggressive IT consolidation strategies, like middleware application consolidation, can be obtained.

If done successfully, IT consolidation can make State of Kansas government run more efficiently, and at the same time serve Kansas' citizens more effectively.